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REPORT

OF THE

TESTS OF METALS

AND

OTHER MATERIALS

FOR

INDUSTRIAL PURPOSES

MADE WITH THE

UNITED STATES TESTING MACHINE AT WATERTOWN ARSENAL, MASSACHUSETTS,

DURING

THE FISCAL YEAR ENDED JUNE 30, 1893.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
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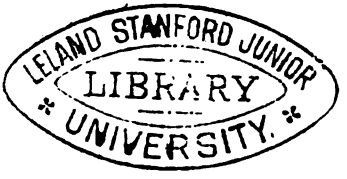

A. 21494.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING

The report of the commanding officer of the Watertown Arsenal of tests of materials for industrial and other purposes made at said arsenal during the fiscal year ended June 30, 1893.

WAR DEPARTMENT,
Washington, D. C., December 12, 1893.

SIR: In compliance with law, I have the honor to herewith transmit the report of the commanding officer of the Watertown Arsenal of "tests of iron, steel, and other materials for industrial purposes," made with the United States testing machine during the fiscal year ended June 30, 1893, together with letter of the Chief of Ordnance, dated the 11th instant, submitting the same.

Very respectfully,

DANIEL S. LAMONT,
Secretary of War.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

WATERTOWN ARSENAL,
Watertown, Mass., December 1, 1893.

SIR: I have the honor to transmit herewith, in compliance with the law, the following report of tests of materials made at this arsenal during the fiscal year ended June 30, 1893.

The total number of specimens tested during the year was 3,256, classified as follows:

Gun specimens	283
For Ordnance Department	166
For other Government departments	199
Investigative tests	242
Tests for private parties	2,366

The receipts and expenditures were as follows:

Amount appropriated for testing machine and testing work	$10,000.00
Received during the year for private tests	1,837.10
Total received	11,837.10

Amount expended for services and labor	$7,961.46
Amount expended for light, power, tools, implements, and material for tests	3,875.64
Total expended	11,837.10

Public tests have continued on material in current fabrication in the Ordnance Department, representing steel forgings for small arms, field, siege, and seacoast guns, steel castings and plates for gun carriage work, cast iron for mortar bodies, and cast iron for gun carriages, shot and shell from the Watertown Arsenal foundry, and other material of miscellaneous order.

The primary object in making these tests is to ascertain whether the specifications for physical properties are met and the metal suitable for acceptance. Incidentally they furnish a record of the progress in iron and steel making and working, and supplement investigative inquiry directed toward the improvement of metallurgical products.

Tests have been made for private parties in all sections of the country, who according to law have availed themselves of the use of the testing machine upon defraying the actual cost of making their tests. These tests are made upon application to the commanding officer of the arsenal. A list of private parties for whom tests were made during the year covered by this report is appended hereto.

Among the investigative tests carried on during the year, attention is called to the results of the first series of observations which have been made on the hydrostatic test of the 8-inch gun-tube section, exposed to interior pressures.

The diametrical expansion and the longitudinal contraction have been determined for different pressures.

It appears that the observed diametrical expansions closely confirmed predicted results. The longitudinal contraction, however, is found to be less than the value heretofore assigned to it, and the ratio of longitudinal contraction to diametrical expansion, instead of being $\frac{1}{3}$, as commonly accepted, appears to be in this tube $\frac{1}{3.54}$.

This ratio was confirmed by other observations made on a plain rectangular bar of steel exposed to tensile stresses.

Other tests of this series will be made and the results published in the next annual report.

The internal strains in a Harveyized steel bar were ascertained, and the hardened exterior was shown to be in a state of initial compression, which in a diametrical direction amounted to 50,600 pounds per square inch.

An extensive series of car couplers has been tested, and the results are contained herein. Eighteen different kinds were represented.

The couplers were of the vertical plane, Janney type, conforming to the contour lines adoped by the master car builders. The differences among the several kinds pertained largely to the locking devices. Drawbars of both malleable iron and steel castings were submitted.

The bars were coupled together in pairs and tested by tension. There were also single-lug tests and tests of the drawbars. The knuckles during the latter tests were removed and special attachments made in the testing machine whereby the strength of the drawbars was determined. The manner of failure of these couplers is fully illustrated by photographs.

Additional tests of brick piers were made. These piers were laid up to illustrate special features in this class of work, and five of the

number after testing were shipped to Chicago, where they were placed on exhibition at the World's Columbian Exposition.

The piers illustrated the variations in strength and rigidity due to the kind of mortar used, and to the manner of laying the bricks, whether on bed or on edge, and also the tendency of a smaller pier or thinner wall to crush a larger base by reason of the transverse fractures of the individual bricks in the larger section.

That a considerable variation in the properties of brick work may be attained is well shown by these tests.

Tests of leather, rubber, and cotton belting have been made in widths from 2 to 30 inches.

Single and double leather belting was tested, also 4 and 6 ply rubber belting and 3, 4, and 6 ply cotton belting.

After ascertaining the strength of the plain samples of belting and completing observations on the elastic properties, tests were made of lacings, belt hooks, and plate fasteners. Cemented scarf joints in leather belting possess important advantages in smoothness of running, and this style of joint is found to have generally as great strength as the better class of laced samples.

The principle involved in good lacing seems to be a well-distributed load over the full width of the belting, and this requires a larger number of lacings than are commonly used.

The strongest laced joint requires the belting to fracture, but it does not follow simply because the belting does fracture that a strong joint has been made.

When a small number of lacings are used the concentration of load on the holes is too great for obtaining the best results; the maximum load which each individual hole is capable of enduring is reached, and the belting, tearing from the holes, then fails in detail. This describes the manner of fracture in a laced specimen in any event, provided the lacings are sufficiently strong, but increasing the number of lacings tends toward a better distribution of the load and makes the stronger joint.

How far this principle may be carried and still improve the strength of the joint is shown by the tests of some 12-inch single-leather samples in which the number of lacings was increased from eleven to thirty-seven, which resulted in a progressive gain in strength as the number of lacings was increased.

Tests of cordage developed the strength of hemp and manila ropes and manila hawsers; also observations were made on the elastic properties of the material.

Endurance tests of rotating shafts have been continued and specimens examined taken from bars after a large number of repeated stresses have been received.

In connection with these tests some very remarkable data have been developed concerning the endurance of shafts at different temperatures. Under a high-fiber stress and a rapid speed of rotation, there soon follows a decided increase in the temperature of the shaft, unless means are employed to prevent it.

When the increase in temperature was allowed to go on, the maximum temperatures ranging between 300° and 400° F., there was a remarkable gain in the endurance of the shafts in each of the seven grades of carbon experimented with over the endurance of those bars which were kept in the vicinity of or below a temperature of 100° F. by means of a stream of cold water played upon the shaft throughout the test.

This branch of the subject will be fully investigated, employing both higher and lower temperatures than have heretofore been used.

Chemical analyses have been made of the important material tested and results embodied with the physical tests, and also there are determinations reported on miscellaneous material.

In the next annual report the tests of ordnance material will be continued, further experiments made on the hydrostatic tests of the 8-inch tube, and the continuation and extension of the endurance tests, investigating other features pertaining to the phases of deterioration which material undergoes prior to rupture.

Material for tempering tests and the heat treatment of steels has been procured and specimens are in preparation.

It is also intended to procure samples of building material, timber, natural stones, and manufactured products which shall illustrate the natural resources of the several States and Territories.

The scope of these tests will be made as wide as practicable that this record of constructive material may contain results and indicate the constructive value of material from all important sources.

The need of another testing machine to supplement the large machine, on which all the tests are now made, has been referred to in the earlier reports, and attention is again invited to this subject.

A machine suitable for testing the smaller specimens, and which would at all times be in readiness to receive that class of test pieces, would materially relieve the large machine and enable investigations to be carried on which are now subjected to frequent interruptions, with a loss in time in adapting the machine to so wide a variety of work.

With the advances made in metallurgical industries and the adoption of engineering designs of greater proportions, notably in bridge construction, there follows a demand for the test of full-sized members, which, to be met, requires a machine of greater power than the present 400-ton machine.

There are many reasons why a machine of great power, adequate to meet present and anticipated needs, should be built and operated by the Government.

There is also a demand for drop tests made with an impact machine.

Tests which are beneficial to the entire country, in adding to the security of life and property against injury from the failure of structures, and which aid in the development of important industries, it is believed to be the part of wisdom to provide for and the demands for such tests acceded to.

The fact that the machine is owned and operated by the Government with no object in view but to ascertain facts, and that the reports of tests go out with the certificate of a Government sworn official gives an authenticity to them that they would not otherwise possess.

Mr. James E. Howard, C. E., continues in charge of the tests, as he has operated the machine since the beginning, and it is due to his zeal, skill, and thoroughness, that the tests are universally accepted as the best possible.

Very respectfully, your obedient servant,

J. W. REILLY,
Major Ordnance Department, U. S. A., Commanding.

The CHIEF OF ORDNANCE, U. S. A.,
Washington, D. C.

ORDNANCE OFFICE, WAR DEPARTMENT,
Washington, December 11, 1893.

SIR: I have the honor to submit for transmission to Congress, as required by law, the report of the commanding officer of the Watertown Arsenal, of "tests of iron, steel and other materials for industrial purposes," made with the United States testing machine during the fiscal year ended June 30, 1893.

Respectfully,

D. W. FLAGLER,
Brigadier-General, Chief of Ordnance.

The SECRETARY OF WAR.

REPORT

OF THE

TESTS OF METALS AND OTHER MATERIALS

FOR

INDUSTRIAL PURPOSES,

MADE WITH THE

UNITED STATES TESTING MACHINE AT WATERTOWN ARSENAL, MASSACHUSETTS,

DURING

THE FISCAL YEAR ENDED JUNE 30, 1893.

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3.2-INCH B. L. STEEL FIELD GUNS.

SPECIMENS FROM TUBES AND JACKETS.

TUBE No. 127.

No. 4789.

Marks, $\frac{32\ R_{127}\ T}{M\ T_1\ M}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	.....	.....	
4,000	20,000	.000600	.000300	.....	.....	
6,000	30,000	.000950	.000350	.....	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001400	.000250	.....	.....	
8,400	42,000	.001500	.000100	.000100	.000100	
8,600	43,000	.001600	.000100	.....	.....	Elastic limit.
8,800	44,000	.003000	.001400	.....	.....	
9,000	45,000	.004500	.001500	.....	.....	
9,200	46,000	.009500	.005000	.....	.....	
9,400	47,000	.010500	.001000	.....	.....	
9,600	48,000	.011100	.000600	.....	.....	
16,070	80,350	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	80,350
Elastic limit per square inch of original section	do...	42,000
Elongation per inch after rupture	inch..	.2400
Elongation per inch under strain at elastic limit	do...	.001600
Reduction in diameter at point of rupture	do...	.145
Reduction in area after rupture, per cent of original section		49.1
Position of rupture		1".1 from neck
Character of broken surface		silky
Elongation of inch sections		".32*, ".16

TUBE No. 128.

No. 4792.

Marks, $\frac{32\ R_{12}\ T}{M\ T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000400	.000300	.....	.....	
4,000	20,000	.000650	.000250	.....	.....	
6,000	30,000	.001000	.000350	.....	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001400	.000250	.....	.....	
8,400	42,000	.001500	.000100	.000300	.000300	Elastic limit.
8,600	43,000	.007600	.006100	.....	.....	
8,800	44,000	.009500	.001900	.....	.....	
9,000	45,000	.010250	.000750	.....	.....	
9,200	46,000	.011000	.000850	.....	.....	
9,400	47,000	.012500	.001500	.....	.....	
15,840	79,200	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	79,200
Elastic limit per square inch of original section	do...	42,000
Elongation per inch after rupture	inch..	.2550
Elongation per inch under strain at elastic limit	do...	.001500
Reduction in diameter at point of rupture	do...	.145
Reduction in area after rupture, per cent of original section		49.1
Position of rupture		1″.1 from neck.
Character of broken surface		silky.
Elongation of inch sections		″.16, ″.35

TUBE NO. 129.

No. 4794.

Marks, $\frac{32\ R_{up}\ T}{B\ T,\ M}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000350	.000250	.....	.....	
4,000	20,000	.000650	.000300	.....	.....	
6,000	30,000	.000950	.000300	.....	.....	
7,000	35,000	.001200	.000250	0.	.....	
8,000	40,000	.001450	.000250	.....	.....	
8,400	42,000	.001550	.000100	0.	.....	
8,600	43,000	.001600	.000050	.....	.....	Elastic limit.
8,800	44,000	.001800	.000200	.....	.....	
9,000	45,000	.004500	.002700	.....	.....	
9,200	46,000	.006600	.002100	.....	.....	
9,400	47,000	.007750	.001150	.....	.....	
9,600	48,000	.008700	.000950	.....	.....	
16,790	83 950	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	83,950
Elastic limit per square inch of original section	do...	43,000
Elongation per inch after rupture	inch..	.2400
Elongation per inch under strain at elastic limit	do...	.001600
Reduction in diameter at point of rupture	do...	.155
Reduction in area after rupture, per cent of original section		51.9
Position of rupture		".55 from neck
Character of broken surface		silky
Elongation of inch sections		".38", ".10

TUBE No. 130.

No. 4798.

Marks, $\frac{32\ R_{126}\ T}{M\ T_{1}\ M}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000400	.000300	.....	.....	
4,000	20,000	.000650	.000250	.....	.....	
6,000	30,000	.001050	.000400	.....	.....	
7,000	35,000	.001250	.000200	0.	.....	
8,000	40,000	.001500	.000250	.....	.....	
8,400	42,000	.001550	.000050	.000150	.000150	Elastic limit.
8,600	43,000	.010400	.008850	.....	.....	
8,800	44,000	.011100	.000700	.....	.....	
9,000	45,000	.012000	.000900	.....	.....	
9,200	46,000	.013000	.001000	.....	.....	
9,400	47,000	.014100	.001100	.....	.....	
15,920	79,600	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	79,600
Elastic limit per square inch of original section	do...	42,000
Elongation per inch after rupture	inch..	.2500
Elongation per inch under strain at elastic limit	do...	.001550
Reduction in diameter at point of rupture	do...	.214
Reduction in area after rupture, per cent of original section		61.5
Position of rupture		".60 from neck
Character of broken surface		silky
Elongation of inch sections		".38", ".12

TUBE NO. 132.

No. 4799.

Marks, $\frac{32\ R_{IIS}\ T}{M\ T_1\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000350	.000250	.....	.....	
4,000	20,000	.000600	.000250	.....	.....	
6,000	30,000	.001000	.000400	.....	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001400	.000250	.....	.....	
8,400	42,000	.001450	.000050	.000050	.000050	
8,600	43,000	.001500	.000050	.....	.....	
8,800	44,000	.001550	.000050	.....	.....	
9,000	45,000	.001550	0.	.....	.....	
9,200	46,000	.001600	.000050	.....	.....	
9,400	47,000	.001600	0.	.....	.....	
9,600	48,000	.001650	.000050	.....	.....	Elastic limit.
9,800	49,000	.005400	.003750	.....	.....	
10,000	50,000	.007000	.001600	.....	.....	
10,200	51,000	.007600	.000600	.....	.....	
10,400	52,000	.008600	.001000	.....	.....	
10,600	53,000	.009800	.001200	.....	.....	
17,390	86,950	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	86,950
Elastic limit per square inch of original section	do...	48,000
Elongation per inch after rupture	inch..	.2050
Elongation per inch under strain at elastic limit	do...	.001650
Reduction in diameter at point of rupture	do...	.184
Reduction in area after rupture, per cent of original section		54.6
Position of rupture		″.10 from neck
Character of broken surface		silky
Elongation of inch sections		″.31*, ″.10

JACKET No. 140.

No. 4804.

Marks, $\frac{32\ R_{100}\ J}{M\ T_1\ O}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000050	.000050	0.	.....	
2,000	10,000	.000300	.000250	.....	.....	
4,000	20,000	.000600	.000300	.....	.....	
6,000	30,000	.001000	.000400	.....	.....	
8,000	40,000	.001400	.000400	.000050	.000050	
9,000	45,000	.001550	.000150	.....	.....	Elastic limit.
9,200	46,000	.012450	.010900	.012000	.011950	
9,400	47,000	.013000	.000550	.....	.....	
9,600	48,000	.013750	.000750	.....	.....	
9,800	49,000	.014600	.000850	.....	.....	
10,000	50,000	.015400	.000800	.....	.....	
17,210	86,050	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	86,050
Elastic limit per square inch of original section	do...	45,000
Elongation per inch after rupture	inch..	.1950
Elongation per inch under strain at elastic limit	do....	.001550
Reduction in diameter at point of rupture	do...	.075
Reduction in area after rupture, per cent of original section		27.4
Position of rupture		".80 from neck
Character of broken surface		granular, dull silky spot near the circumference
Elongation of inch sections		".26*, ".13

JACKET No. 141.

No. 4803.

Marks, $\frac{82\,B_{14}\,J}{B\,T_2\,I}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000050	.000050	0.	.....	
2,000	10,000	.000300	.000250	.....	.....	
4,000	20,000	.000600	.000300	.....	.....	
6,000	30,000	.001000	.000400	.....	.....	
8,000	40,000	.001400	.000400	.000050	.000050	
9,200	46,000	.001600	.000200	.....	.....	Elastic limit.
		.001900	.000300	.000400	.000350	
9,400	47,000	.009500	.007600	.....	.....	
9,600	48,000	.010500	.001000	.....	.....	
9,800	49,000	.011400	.000900	.....	.....	
10,000	50,000	.012250	.000850	.....	.....	
10,200	51,000	.013500	.001250	.....	.....	
16,980	84,900	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	84,980
Elastic limit per square inch of original section	do...	46,000
Elongation per inch after rupture	inch..	.2350
Elongation per inch under strain at elastic limit	do...	.001600
Reduction in diameter at point of rupture	do...	.125
Reduction in area after rupture, per cent of original section		43.3
Position of rupture		″.90 from neck
Character of broken surface		silky
Elongation of inch sections		″.33*, ″.14

JACKET No. 142.

No. 4820.

Marks, $\frac{32\ R_{16}\ J}{M\ T_2\ O}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000400	.000300	.....	.....	
4,000	20,000	.000600	.000200	.....	.....	
6,000	30,000	.001000	.000400	.....	.....	
8,000	40,000	.001350	.000350	0.	.....	
9,200	46,000	.001500	.000150	0.	.....	
9,400	47,000	.001500	0.	.....	.....	
9,600	48,000	.001550	.000050	.....	.....	
9,800	49,000	.001550	0.	.....	.....	
10,000	50,000	.001600	.000050	.....	.....	
10,200	51,000	.001650	.000050	.....	.....	Elastic limit.
10,400	52,000	.001800	.000150	.....	.....	
10,600	53,000	.003000	.001200	.....	.....	
10,800	54,000	.004300	.001300	.....	.....	
11,000	55,000	.005400	.001100	.....	.....	
11,200	56,000	.006500	.001100	.....	.....	
19,520	97,600	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	97,600
Elastic limit per square inch of original section	do...	51,000
Elongation per inch after rupture	inch..	.1550
Elongation per inch under strain at elastic limit	do...	.001650
Reduction in diameter at point of rupture	do...	.155
Reduction in area after rupture, per cent of original section		16.9
Position of rupture		″.45 from neck
Character of broken surface		granular, radiating from a point in the circumference
Elongation of inch sections		″.18*, ″.13

JACKET No. 143.

No. 4807.

Marks, $\frac{32\ R_{1/2}\ J}{B\ T_2\ I}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000050	.000050	0.	.....	
2,000	10,000	.000300	.000250	.....	.....	
4,000	20,000	.000600	.000300	.....	.....	
6,000	30,000	.000950	.000350	.....	.....	
8,000	40,000	.001250	.000300	0.	.....	
8,800	44,000	.001400	.000150	.....	.....	Elastic limit.
9,000	45,000	.008250	.006850	.....	.....	
9,200	46,000	.009750	.001500	.....	.....	
9,400	47,000	.010750	.001000	.....	.....	
9,600	48,000	.011500	.000750	.....	.....	
9,800	49,000	.012350	.000850	.....	.....	
16,640	83,200	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	83,200
Elastic limit per square inch of original section	do...	44,000
Elongation per inch after rupture	inch..	.2450
Elongation per inch under strain at elastic limit	do...	.001400
Reduction in diameter at point of rupture	do...	.125
Reduction in area after rupture, per cent of original section		43.3
Position of rupture		″.90 from neck
Character of broken surface		silky
Elongation of inch sections		″.34*, ″.15

JACKET No. 143.

No. 4813.

Marks, $\frac{32\ R_{143}\ J}{M\ T_2\ O}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000350	.000250	.....	.....	
4,000	20,000	.000600	.000250	.....	.....	
6,000	30,000	.000950	.000350	.....	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001300	.000200	.....	.....	
8,400	42,000	.001400	.000100	0.	.....	
8,600	43,000	.001450	.000050	.....	.....	
8,800	44,000	.001450	0.	.....	.....	
9,000	45,000	.001500	.000050	.....	.....	
9,200	46,000	.001500	0.	.....	.....	
9,400	47,000	.001550	.000050	.....	.....	
9,600	48,000	.001550	0.	.....	.....	
9,800	49,000	.001600	.000050	.....	.....	
10,000	50,000	.001600	0.	.....	.....	
10,200	51,000	.001650	.000050	.....	.....	Elastic limit.
10,400	52,000	.001800	.000150	.....	.....	
10,600	53,000	.001950	.000150	.....	.....	
10,800	54,000	.002050	.000100	.....	.....	
11,000	55,000	.003650	.001600	.....	.....	
		.004600	.000950	.....	.....	
11,200	56,000	.005950	.001350	.....	.....	
19,610	98,050	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	98,050
Elastic limit per square inch of original section	do...	51,000
Elongation per inch after rupture	inch..	.2400
Elongation per inch under strain at elastic limit	do...	.001650
Reduction in diameter at point of rupture	do...	.125
Reduction in area after rupture, per cent of original section		43.3
Position of rupture		".90 from neck
Character of broken surface		silky, interspersed with fine granulation
Elongation of inch sections		".13, ".35+

JACKET No. 148.

No. 4821.

Marks, $\frac{32\,R_{1}\,\mathcal{Q}\,J}{B\,T,I}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000400	.000300	.....	.....	
4,000	20,000	.000700	.000300	.....	.....	
6,000	30,000	.001050	.000350	.....	.....	
8,000	40,000	.001400	.000350	0.	.....	
9,200	46,000	.001650	.000250	0.	.....	
9,400	47,000	.001700	.000050	.....	.....	
9,600	48,000	.001850	.000150	.....	.....	Elastic limit.
9,800	49,000	.004300	.002450	.....	.....	
10,000	50,000	.007500	.003200	.....	.....	
10,200	51,000	.009250	.001750	.....	.....	
10,400	52,000	.010000	.000750	.....	.....	
10,600	53,000	.010500	.000500	.....	.....	
17,270	86,350	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	86,350
Elastic limit per square inch of original section	do...	48,000
Elongation per inch after rupture	inch..	.2500
Elongation per inch under strain at elastic limit	do...	.001850
Reduction in diameter at point of rupture	do...	.145
Reduction in area after rupture, per cent of original section		49.1
Position of rupture		1."1 from neck
Character of broken surface		silky
Elongation of inch sections		".32", ".18

JACKET No. 149.

No. 4819.

Marks, $\frac{32}{M}\ \frac{R}{T}\ \frac{1}{0}\ \frac{e}{6}\ J$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000400	.000300	.....	.....	
4,000	20,000	.000600	.000200	.....	.....	
6,000	30,000	.001000	.000400	.....	.....	
8,000	40,000	.001300	.000300	0.	.....	
9,200	46,000	.001450	.000150	0.	.....	
9,400	47,000	.001500	.000050	.....	.....	
9,600	48,000	.001500	0.	.....	.....	
9,800	49,000	.001500	0.	.....	.....	
10,000	50,000	.001550	.000050	.....	.....	
10,200	51,000	.001550	0.	.....	.....	Elastic limit.
10,400	52,000	.006500	.004950	.....	.....	
10,600	53,000	.007900	.001400	.....	.....	
10,800	54,000	.008650	.000750	.....	.....	
11,000	55,000	.009650	.001000	.....	.....	
11,200	56,000	.010550	.000900	.....	.....	
18,110	90,550	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	90,550
Elastic limit per square inch of original section	do...	51,000
Elongation per inch after rupture	inch..	.2300
Elongation per inch under strain at elastic limit	do...	.001550
Reduction in diameter at point of rupture	do...	.125
Reduction in area after rupture, per cent of original section		43.3
Position of rupture		".7 from neck
Character of broken surface		silky
Elongation of inch sections		".13, ".33*

TABULATION OF TENSION SPECIMENS FROM 3.2-INCH B. L. STEEL FIELD GUNS.

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Contraction of area.	Appearance of fracture.
			Pounds.	*Pounds.*	*Per cent.*	*Per cent.*	
4789	Tube No. 127...	Middle ...	43,000	80,350	24.0	49.1	Silky.
4792	Tube No. 128...	.....do	42,000	79,200	25.5	49.1	Do.
4794	Tube No. 129...	.....do	43,000	83,950	24.0	51.9	Do.
4798	Tube No. 130...	.....do	42,000	79,600	25.0	61.5	Do.
4799	Tube No. 132...	.....do	48,000	86,950	20.5	54.6	Do.
4804	Jacket No. 140..	Outside...	45,000	86,050	19.5	27.4	Granular, dull silky spot.
4803	Jacket No. 141..	Inside	46,000	84,900	23.5	43.3	Silky.
4520	Jacket No. 142..	Outside...	51,000	97,600	15.5	16.9	Granular.
4807	Jacket No. 143..	Inside	44,000	83,200	24.5	43.3	Silky.
4818	.....do.....	Outside...	51,000	98,050	24.0	43.3	Silky and fine granular.
4821	Jacket No. 148.	Inside	48,000	86,350	25.0	49.1	Silky.
4819	Jacket No. 149.	Outside...	51,000	90,550	23.0	43.3	Do.

5-INCH B. L. STEEL SIEGE RIFLES.

SPECIMENS FROM TUBES AND JACKETS.

TUBE No. 1.

No. 4800.

Marks, $\frac{5\ R,\ T}{B\ T,\ I}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000400	.000300	.....	.....	
4,000	20,000	.000650	.000250	.....	.....	
6,000	30,000	.000950	.000300	.....	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001300	.000200	.....	.....	
8,400	42,000	.001400	.000100	0.	.....	
8,600	43,000	.001450	.000050	.....	.....	
8,800	44,000	.001450	0.	.....	.....	
9,000	45,000	.001500	.000050	.....	.....	
9,200	46,000	.001500	0.	.....	.....	
9,400	47,000	.001550	.000050	.....	.....	
9,600	48,000	.001550	0.	.....	.....	
9,800	49,000	.001600	.000050	.....	.....	Elastic limit.
10,000	50,000	.001800	.000200	.....	.....	
10,200	51,000	.001950	.000150	.....	.....	
10,400	52,000	.003250	.001300	.....	.....	
10,600	53,000	.006250	.003000	.....	.....	
10,800	54,000	.007600	.001350	.....	.....	
17,250	86,250	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	86,250
Elastic limit per square inch of original section	do...	49,000
Elongation per inch after rupture	inch..	.2350
Elongation per inch under strain at elastic limit	do...	.001600
Reduction in diameter at point of rupture	do...	.194
Reduction in area after rupture, per cent of original section		57.0
Position of rupture		1".05 from neck
Character of broken surface		silky
Elongation of inch sections		".30", ".17

TUBE No. 2.

No. 4801.

Marks, $\frac{5\ R\ T}{M\ T,\ O}$
Diameter, $''.505$.
Sectional area, .20 square inch.
Gauged length, $2''$.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000050	.000050	0.	.....	
2,000	10,000	.000250	.000200	.....	.....	
4,000	20,000	.000550	.000300	.....	.....	
6,000	30,000	.000900	.000350	.....	.....	
7,000	35,000	.001050	.000150	0.	.....	
8,000	40,000	.001650	.000600	.....	.....	Elastic limit below 40,000 pounds per square inch.
8,200	41,000	.008950	.007300	.....	.....	
8,400	42,000	.009250	.000300	.....	.....	
8,600	43,000	.010400	.001150	.....	.....	
8,800	44,000	.011500	.001100	.....	.....	
15,790	78,950	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section ..... pounds.. 78,950
Elastic limit per square inch of original section ..... below 40,000 pounds
Elongation per inch after rupture ..... inch.. .2000
Reduction in diameter at point of rupture ..... do... .085
Reduction in area after rupture, per cent of original section 30.7
Position of rupture ..... ".7 from neck
Character of broken surface..... granular, 60 per cent; dull, flaky, 40 per cent. Opened cracks in stem in vicinity of place of rupture.
Elongation of inch sections ..... ".14, ".26*

TUBE NO. 4.

No. 4812.

Marks, $\frac{5\ R_1\ T}{M\ T_1\ O}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	.....	.....	
4,000	20,000	.000600	.000300	.....	.....	
6,000	30,000	.000950	.000350	.....	.....	
7,000	35,000	.001100	.000150	.000050	.000050	
8,000	40,000	.001300	.000200	.....	.....	
8,400	42,000	.001350	.000050	.000050	0.	
8,600	43,000	.001400	.000050	.....	.....	
8,800	44,000	.001450	.000050	.....	.....	
9,000	45,000	.001500	.000050	.....	.....	
9,200	46,000	.001500	0.	.....	.....	
9,400	47,000	.001500	0.	.....	.....	
9,600	48,000	.001550	.000050	.....	.....	
9,800	49,000	.001550	0.	.....	.....	
10,000	50,000	.001600	.000050	.....	.....	
10,200	51,000	.001700	.000100	.....	.....	Elastic limit.
10,400	52,000	.001950	.000250	.....	.....	
10,800	53,000	.002950	.001000	.....	.....	
10,800	54,000	.005400	.002450	.....	.....	
11,000	55,000	.006450	001050	.....	.....	
18,320	91,600	.007400	.000950	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,600
Elastic limit per square inch of original section	do...	51,000
Elongation per inch after rupture	inch..	.2300
Elongation per inch under strain at elastic limit	do...	.001700
Reduction in diameter at point of rupture	do...	.125
Reduction in area after rupture, per cent of original section		43.3
Position of rupture		1".15 from neck
Character of broken surface		silky
Elongation of inch sections		".23", ".13

TUBE No. 6.

No. 4822.

Marks, $\frac{5}{M}\frac{R_1}{T_1}\frac{T}{O}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000050	.000050	0.	.....	
2,000	10,000	.000200	.000150	.....	.....	
4,000	20,000	.000500	.000300	.....	.....	
6,000	30,000	.000900	.000400	.....	.....	
7,000	35,000	.001000	.000100	0.	.....	
8,000	40,000	.001200	.000200	.....	.....	
8,400	42,000	.001300	.000100	0.	.....	
8,600	43,000	.001350	.000050	.....	.....	
8,800	44,000	.001400	.000050	.....	.....	
9,000	45,000	.001450	.000050	.....	.....	
9,200	46,000	.001500	.000050	.....	.....	
9,400	47,000	.001500	0.	.....	.....	
9,600	48,000	.001550	.000050	.....	.....	
9,800	49,000	.001550	0.	.....	.....	
10,000	50,000	.001600	.000050	.....	.....	Elastic limit.
10,200	51,000	.007500	.005900	.....	.....	
10,400	52,000	.008500	.001000	.....	.....	
10,600	53,000	.009500	.001000	.....	.....	
10,800	54,000	.010250	.000750	.....	.....	
11,000	55,000	.011500	.001250	.....	.....	
17,690	88,450	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	88,450
Elastic limit per square inch of original section	do...	50,000
Elongation per inch after rupture	inch..	.2450
Elongation per inch under strain at elastic limit	do...	.001600
Reduction in diameter at point of rupture	do...	.145
Reduction in area after rupture, per cent of original section		19.1
Position of rupture		".95 from neck
Character of broken surface		silky
Elongation of inch sections		".33*, ".16

JACKET No. 3.

No. 4827.

Marks, $\frac{5\ R\ J}{M\ T\ O}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000333	.000233	.....	.....	
5,000	20,000	.000667	.000334	.....	.....	
7,500	30,000	.001000	.000333	.....	.....	
10,000	40,000	.001333	.000333	0.	.....	
11,500	46,000	.001567	.000234	0.	.....	
11,750	47,000	.001600	.000033	.....	.....	
12,000	48,000	.001633	.000033	.....	.....	
12,250	49,000	.001667	.000034	.....	.....	
12,500	50,000	.001700	.000033	.....	.....	
12,750	51,000	.001733	.000033	.....	.....	
13,000	52,000	.001767	.000034	.....	.....	
13,250	53,000	.001800	.000033	.....	.....	Elastic limit.
13,500	54,000	.001967	.000167	.....	.....	
13,750	55,000	.003500	.001533	.....	.....	
14,000	56,000	.006000	.002500	.....	.....	
14,250	57,000	.007000	.001000	.....	.....	
14,500	58,000	.008000	.001000	.....	.....	
23,340	93,360	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	93,360
Elastic limit per square inch of original section	do...	53,000
Elongation per inch after rupture	inch..	.1933
Elongation per inch under strain at elastic limit	do...	.001800
Reduction in diameter at point of rupture	do...	.134
Reduction in area after rupture, per cent of original section		41.9
Position of rupture		1".1 from neck
Character of broken surface		silky
Elongation of inch sections		",26*, ",21, ",11

JACKET NO. 5.

No. 4828.

Marks, $\frac{5\ R_s\ J}{B\ T_r\ I}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000333	.000200	.....	.....	
5,000	20,000	.000667	.000334	.....	.....	
7,500	30,000	.001000	.000333	.....	.....	
10,000	40,000	.001367	.000367	0.	.....	
11,500	46,000	.001567	.000200	0.	.....	
11,750	47,000	.001633	.000066	.....	.....	
12,000	48,000	.001667	.000034	.....	.....	
12,250	49,000	.001733	.000066	.....	.....	
12,500	50,000	.001800	.000067	.....	.....	Elastic limit.
12,750	51,000	.002833	.001033	.....	.....	
13,000	52,000	.007500	.004667	.....	.....	
13,250	53,000	.008167	.000667	.....	.....	
13,500	54,000	.009333	.001166	.....	.....	
13,750	55,000	.010000	.000667	.....	.....	
22,190	88,760	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	88,760
Elastic limit per square inch of original section	do...	50,000
Elongation per inch after rupture	inch..	.1667
Elongation per inch under strain at elastic limit	do...	.001800
Reduction in diameter at point of rupture	do...	.064
Reduction in area after rupture, per cent of original section		21.4
Position of rupture		1".1 from neck
Character of broken surface		granular, flaky streak 5 per cent; opened minute cracks in stem in vicinity of rupture.
Elongation of inch sections		".18", ".19, ".13

JACKET No. 7.

No. 4830.

Marks, $\frac{5\ R_1\ J}{M\ T_1\ O}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	.....	
2,500	10,000	.000267	.000200	.....	.....	
5,000	20,000	.000600	.000333	.....	.....	
7,500	30,000	.000900	.000300	.....	.....	
10,000	40,000	.001233	.000333	0.	.....	
11,500	46,000	.001367	.000134	0.	.....	
11,750	47,000	.001400	.000033	.....	.....	
12,000	48,000	.001433	.000033	.....	.....	
12,250	49,000	.001467	.000034	.....	.....	
12,500	50,000	.001583	.000066	.....	.....	
12,750	51,000	.001600	.000067	.....	.....	
13,000	52,000	.001633	.000033	.....	.....	
13,250	53,000	.001667	.000034	.....	.....	
13,500	54,000	.001733	.000066	.....	.....	Elastic limit
13,750	55,000	.005000	.003267	.....	.....	
14,000	56,000	.006400	.001400	.....	.....	
14,250	57,000	.007500	.001100	.....	.....	
14,500	58,000	.008333	.000833	.....	.....	
14,750	59,000	.009000	.000667	.....	.....	
24,120	96,480	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	96,480
Elastic limit per square inch of original section	do...	54,000
Elongation per inch after rupture	inch..	.2200
Elongation per inch under strain at elastic limit	do...	.001733
Reduction in diameter at point of rupture	do...	.154
Reduction in area after rupture, per cent of original section		47.2
Position of rupture		1″.6 from neck
Character of broken surface		silky
Elongation of inch sections		″.14, ″.38*, ″.14

JACKET No. 8.

No. 4829.

Marks, $\frac{5\ R_2\ J}{M\ T_1\ O}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3."

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	.....	
2,500	10,000	.000300	.000233	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000933	.000300	.....	.....	
10,000	40,000	.001267	.000334	0.	.....	
11,500	46,000	.001433	.000166	0.	.....	
11,750	47,000	.001500	.000067	.....	.....	
12,000	48,000	.001533	.000033	.....	.....	
12,250	49,000	.001567	.000034	.....	.....	
12,500	50,000	.001600	.000033	.....	.....	
12,750	51,000	.001633	.000033	.....	.....	
13,000	52,000	.001667	.000034	.....	.....	
13,250	53,000	.001700	.000033	.....	.....	Elastic limit.
13,500	54,000	.001833	.000133	.....	.....	
13,750	55,000	.002333	.000500	.....	.....	
14,000	56,000	.004333	.002000	.....	.....	
14,250	57,000	.005667	.001334	.....	.....	
14,500	58,000	.006500	.000833	.....	.....	
24,160	96,640	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	96,640
Elastic limit per square inch of original section	do...	53,000
Elongation per inch after rupture	inch..	.2100
Elongation per inch under strain at elastic limit	do...	.001700
Reduction in diameter at point of rupture	do...	.154
Reduction in area after rupture, per cent of original section		47.2
Position of rupture		1".8 from neck
Character of broken surface		silky
Elongation of inch sections		".13, ".36*, ".14

TABULATION OF TENSION SPECIMENS FROM 5-INCH B. L. STEEL SIEGE RIFLES.

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Contraction of area.	Appearance of fracture.
			Pounds.	*Pounds.*	*Per cent.*	*Per cent.*	
4800	Tube No. 1....	Inside	49,000	86,250	23.5	57.0	Silky.
4801	Tube No. 2....	Outside...	*40,000	78,950	20.0	30.7	Granular, 60 per cent; dull, flaky, 40 per cent.
4812	Tube No. 4....	....do	51,000	91,600	23.0	43.3	Silky.
4822	Tube No. 6....	....do	50,000	88,450	24.5	49.1	Do.
4827	Jacket No. 3...	.....	53,000	93,360	19.3	41.9	Do.
4828	Jacket No. 5...	Inside	50,000	88,760	16.7	21.4	Granular, flaky streak 5 per cent.
4830	Jacket No. 7...	Outside...	54,000	96,480	22.0	47.2	Silky.
4829	Jacket No. 9...	....do	53,000	96,640	21.0	47.2	Do.

*Below.

7-INCH B. L. SIEGE HOWITZER.

SPECIMENS FROM TUBES AND JACKETS.

TUBE NO. 14.

No. 4810.

Marks, $^{7\,H_{14}\,T}_{B\,T_2\,I}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000050	.000050	0.	.....	
2,000	10,000	.000350	.000300	.....	.....	
4,000	20,000	.000650	.000300	.....	.....	
6,000	30,000	.001000	.000350	.....	.....	
7,000	35,000	.001100	.000100	.....	.....	
8,000	40,000	.001300	.000200	.....	.....	
8,200	41,000	.001350	.000050	.....	.....	Elastic limit.
8,400	42,000	.002000	.000650	.000600	.000600	
8,600	43,000	.004000	.002000	.....	.....	
8,800	44,000	.005950	.001950	.....	.....	
9,000	45,000	.007000	.001050	.....	.....	
9,200	46,000	.008000	.001000	.....	.....	
15,890	79,450	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	79,450
Elastic limit per square inch of original section	do...	41,000
Elongation per inch after rupture	inch..	.2850
Elongation per inch under strain at elastic limit	do...	.001350
Reduction in diameter at point of rupture	do...	.165
Reduction in area after rupture, per cent of original section		54.6
Position of rupture		1″.15 from neck
Character of broken surface		silky
Elongation of inch sections		″.17, ″.40*

TUBE No. 16.

No. 4811.

Marks, $^{7\ H_{16}\ T}_{B\ T_2\ I}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	.....	.....	
4,000	20,000	.000550	.000300	.....	.....	
6,000	30,000	.000900	.000350	.....	.....	
7,000	35,000	.001050	.000150	0.	.....	
8,000	40,000	.001300	.000250	.....	.....	
8,400	42,000	.001400	.000100	0.	.....	
8,600	43,000	.001450	.000050	.....	.....	
8,800	44,000	.001500	.000050	.....	.....	
9,000	45,000	.001550	.000050	.....	.....	Elastic limit.
9,200	46,000	.001950	.000400	.....	.....	
9,400	47,000	.004250	.002300	.....	.....	
9,600	48,000	.005600	.001350	.....	.....	
9,800	49,000	.007000	.001400	.....	.....	
10,000	50,000	.008100	.001100	.....	.....	
16,660	83,300	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	83,300
Elastic limit per square inch of original section	do...	45,000
Elongation per inch after rupture	inch..	.2350
Elongation per inch under strain at elastic limit	do...	.001550
Reduction in diameter at point of rupture	do...	.135
Reduction in area after rupture, per cent of original section		46.2
Position of rupture		″.70 from neck
Character of broken surface		silky
Elongation of inch sections		″.34*, ″.13

TUBE No. 19.

No. 4826.

Marks, $\frac{7\ H_{19}\ T}{B\ T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000350	.000250	.....	.....	
4,000	20,000	.000700	.000350	.....	.....	
6,000	30,000	.001000	.000300	.....	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001450	.000300	.....	.....	
8,400	42,000	.001500	.000050	.000100	.000100	
8,600	43,000	.001550	.000050	.....	.....	
8,800	44,000	.001600	.000050	.....	.....	
9,000	45,000	.001750	.000150	.....	.....	
9,200	46,000	.001850	.000100	.....	.....	Elastic limit.
9,400	47,000	.002500	.000650	.....	.....	
9,600	48,000	.005500	.003000	.....	.....	
9,800	49,000	.007250	.001750	.....	.....	
10,000	50,000	.009000	.001750	.....	.....	
10,200	51,000	.010000	.001000	.....	.....	
17,290	86,450	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	86,450
Elastic limit per square inch of original section	do...	46,000
Elongation per inch after rupture	inch..	.2200
Elongation per inch under strain at elastic limit	do...	.001850
Reduction in diameter at point of rupture	do...	.105
Reduction in area after rupture, per cent of original section		37.1
Position of rupture		″.95 from neck
Character of broken surface		silky, oblique
Elongation of inch sections		″.26*, ″.18

TUBE NO. 20.

No. 4823.

Marks, $^{7\,H_{B}\,T}_{B\,T;I}$
Diameter, $''.505$.
Sectional area, .20 square inch.
Gauged length, $2''$.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	.....	.....	
4,000	20,000	000550	.000300	.....	.....	
6,000	30,000	.000950	.000400	.....	.....	
7,000	35,000	.001050	.000100	0.	.....	
8,000	40,000	.001250	.000200	.....	.....	Elastic limit.
8,200	41,000	.009900	.008650	.....	.....	
8,400	42,000	.011000	.001100	.009300	.009300	
8,600	43,000	.011750	.000750	.....	.....	
8,800	44,000	.013000	.001250	.....	.....	
9,000	45,000	.014500	.001500	.....	.....	
14,760	73,800	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	73,800
Elastic limit per square inch of original section	do...	40,000
Elongation per inch after rupture	inch..	.2350
Elongation per inch under strain at elastic limit	do...	.001250
Reduction in diameter at point of rupture	do...	.095
Reduction in area after rupture, per cent of original section		34.0
Position of rupture		".90 from neck
Character of broken surface		silky, serrated
Elongation of inch sections		"16, ".31*

JACKET No. 11.

No. 4793.

Marks, $\frac{7\ H_{11}\ J}{B\ T_{2}\ I}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Sucessive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000300	.000167	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000967	.000334	.....	.....	
10,000	40,000	.001300	.000333	.000033	.000033	
11,500	46,000	.001567	.000267	.000067	.000034	
11,750	47,000	.001633	.000066	.....	.....	
12,000	48,000	.001667	.000034	.....	.....	
12,250	49,000	.001700	.000033	.....	.....	Elastic limit.
12,500	50,000	.001967	.000267	.....	.....	
12,750	51,000	.003000	.001033	.....	.....	
13,000	52,000	.004667	.001667	.....	.....	
13,250	53,000	.006000	.001333	.....	.....	
13,500	54,000	.007000	.001000	.....	.....	
23,260	93,040	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	93,040
Elastic limit per square inch of original section	do...	49,000
Elongation per inch after rupture	inch..	.2067
Elongation per inch under strain at elastic limit	do...	.001700
Reduction in diameter at point of rupture	do...	.144
Reduction in area after rupture, per cent of original section		44.6
Position of rupture		1".8 from neck
Character of broken surface		silky
Elongation of inch sections		".14, ".36*, ".12

JACKET NO. 12.

No. 4796.

Marks, $\frac{7\ H_2\ J}{M\ T_1\ O}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	.....	
2,500	10,000	.000300	.000233	.....	.....	
5,000	20,000	.000600	.000300	.....	.....	
7,500	30,000	.000933	.000333	.....	.....	
10,000	40,000	.001267	.000334	0.	.....	
11,500	46,000	.001500	.000233	.000033	.000033	
11,750	47,000	.001533	.000033	.....	.....	
12,000	48,000	.001567	.000034	.....	.....	
12,250	49,000	.001600	.000033	.....	.....	
12,500	50,000	.001633	.000033	.....	.....	
12,750	51,000	.001667	.000034	.....	.....	
13,000	52,000	.001733	.000066	.....	.....	
13,250	53,000	.001767	.000034	.....	.....	Elastic limit.
13,500	54,000	.001967	.000200	.....	.....	
13,750	55,000	.002067	.000100	.....	.....	
14,000	56,000	.002667	.000600	.....	.....	
14,250	57,000	.003667	.001000	.....	.....	
14,500	58,000	.005000	.001333	.....	.....	
24,040	96,160	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	96,160
Elastic limit per square inch of original section	.do...	53,000
Elongation per inch after rupture	inch..	.2033
Elongation per inch under strain at elastic limit	do...	.001767
Reduction in diameter at point of rupture	do...	.144
Reduction in area after rupture, per cent of original section		44.6
Position of rupture		1″.6 from neck
Character of broken surface		granular, 60 per cent; silky, 40 per cent
Elongation of inch sections		″.13, ″.35*, ″.13

JACKET NO. 13.

No. 4797.

Marks, $\frac{7\ H_1\ J}{B\ T_1\ I}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000667	.000367	.....	.....	
7,500	30,000	.001000	.000333	.....	.....	
10,000	40,000	.001367	.000367	.000033	.000033	
11,500	46,000	.001633	.000266	.000100	.000067	
11,750	47,000	.001700	.000067	.....	.....	Elastic limit
12,000	48,000	.001867	.000167	.....	.....	
12,250	49,000	.002100	.000233	.....	.....	
12,500	50,000	.004167	.002067	.....	.....	
12,750	51,000	.005267	.001100	.....	.....	
13,000	52,000	.006333	.001066	.....	.....	
22,170	88,680	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	88,680
Elastic limit per square inch of original section	do...	47.000
Elongation per inch after rupture	inch..	.2133
Elongation per inch under strain at elastic limit	do...	.001700
Reduction in diameter at point of rupture	do...	.164
Reduction in area after rupture, per cent of original section		49.7
Position of rupture		1″.2 from neck
Character of broken surface		silky
Elongation of inch sections		″.28*, ″.23, ″.13

JACKET No. 15.

No. 4795.

Marks, $\frac{7\ H_{15}\ J}{B\ T_{1}\ I}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	.....	
2,500	10,000	.000267	.000200	.....	.....	
5,000	20,000	.000467	.000200	.....	.....	
7,500	30,000	.000700	.000233	.....	.....	
10,000	40,000	.001033	.000333	0.	.....	
11,500	46,000	.001333	.000300	0.	.....	
11,750	47,000	.001367	.000034	.....	.....	
12,000	48,000	.001400	.000033	.....	.....	
12,250	49,000	.001433	.000033	.....	.....	Elastic limit.
12,500	50,000	.001533	.000100	.....	.....	
12,750	51,000	.001633	.000100	.....	.....	
13,000	52,000	.001733	.000100	.....	.....	
13,250	53,000	.002000	.000267	.....	.....	
13,500	54,000	.003667	.001667	.....	.....	
23,980	95,920	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	95,920
Elastic limit per square inch of original section	do...	49,000
Elongation per inch after rupture	inch..	.1900
Elongation per inch under strain at elastic limit	do...	.001433
Reduction in diameter at point of rupture	do...	.124
Reduction in area after rupture, per cent of original section		39.2
Position of rupture		".85 from neck
Character of broken surface		silky, slightly granular
Elongation of inch sections		".31*, ".13, ".13

TABULATION OF TENSION SPECIMENS FROM 7-INCH B. L. SIEGE HOWITZER.

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Contraction of area.	Appearance of fracture.
			Pounds.	*Pounds.*	*Per cent.*	*Per cent.*	
4810	Tube No. 14	Inside	41,000	79,450	28.5	54.6	Silky.
4811	Tube No. 16	do	45,000	83,300	23.5	46.2	Do.
4826	Tube No. 19	Middle	46,000	86,450	22.0	37.1	Silky, oblique.
4823	Tube No. 20	Inside	40,000	73,800	23.5	34.0	Silky, serrated.
4793	Jacket No. 11	Inside	49,000	93,040	20.7	44.6	Silky.
4796	Jacket No. 12	Outside	53,000	96,160	20.3	44.6	Granular, 60 per cent; silky, 40 per cent.
4797	Jacket No. 13	Inside	47,000	88,680	21.3	49.7	Silky.
4795	Jacket No. 15	do	49,000	95,920	19.0	39.2	Silky, slightly granular.

8-INCH STEEL B. L. RIFLES.

SPECIMENS FROM TUBES AND JACKETS.

TUBE NO. 2.

No. 4890.

Marks, $^{8\ R\ R_2\ T}_{B\ T_2\ M}$
Diameter, ″.565.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000267	.000167	.....	.....	
5,000	20,000	.000633	.000366	.....	.....	
7,500	30,000	.000967	.000334	.....	.....	
8,750	35,000	.001133	.000166	0.	.....	
10,000	40,000	.001333	.000200	.....	.....	
10,500	42,000	.001400	.000067	.000033	.000033	
10,750	43,000	.001433	.000033	.....	.....	
11,000	44,000	.001467	.000034	.....	.....	
11,250	45,000	.001500	.000033	.....	.....	
11,500	46,000	.001567	.000067	.....	.....	
11,750	47,000	.001633	.000066	.....	.....	Elastic limit.
12,000	48,000	.004067	.002434	.....	.....	
12,250	49,000	.005000	.000933	.....	.....	
12,500	50,000	.006000	.001000	.....	.....	
12,750	51,000	.006667	.000667	.....	.....	
13,000	52,000	.008000	.001333	.....	.....	
21,820	87,280	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	87,280
Elastic limit per square inch of original section	do...	47,000
Elongation per inch after rupture	inch..	.2133
Elongation per inch under strain at elastic limit	do...	.001633
Reduction in diameter at point of rupture	do...	.155
Reduction in area after rupture, per cent of original section		47.2
Position of rupture		1″.6 from neck
Character of broken surface		silky
Elongation of inch sections		″.12, ″.38*, ″.14

No. 4889.

Marks, $\frac{8\ R\ B_M\ T}{M\ T_M\ M}$
Diameter, ″.565.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000333	.000200	.....	.....	
5,000	20,000	.000667	.000334	.....	.....	
7,500	30,000	.001000	.000333	.....	.....	
8,750	35,000	.001200	.000200	.000033	.000033	
10,000	40,000	.001367	.000167	.....	.....	
10,500	42,000	.001400	.000033	.000033	.0	
10,750	43,000	.001433	.000033	.....	.....	
11,000	44,000	.001500	.000067	.....	.....	
11,250	45,000	.001567	.000067	.....	.....	
11,500	46,000	.001633	.000066	.....	.....	
11,750	47,000	.001667	.000034	.....	.....	Elastic limit.
12,000	48,000	.006667	.005000	.....	.....	
12,250	49,000	.010333	.003666	.....	.....	
12,500	50,000	.011167	.000834	.....	.....	
12,750	51,000	.012167	.001000	.....	.....	
13,000	52,000	.013333	.001166	.....	.....	
20,710	82,840	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	82,840
Elastic limit per square inch of original section	do...	47,000
Elongation per inch after rupture	inch..	.2400
Elongation per inch under strain at elastic limit	do...	.001667
Reduction in diameter at point of rupture	do...	.145
Reduction in area after rupture, per cent of original section		44.6
Position of rupture		1″ from neck
Character of broken surface		silky
Elongation of inch sections		″.16, ″.19, ″.37

TUBE No. 11.

No. 4783.

Marks, $\frac{8R_{11}T}{B\,T_1\,O}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000600	.000300	.....	.....	
7,500	30,000	.000900	.000300	.....	.....	
8,750	35,000	.001067	.000167	0.	.....	
10,000	40,000	.001267	.000200	.....	.....	
10,500	42,000	.001333	.000066	.000033	.000033	
10,750	43,000	.001367	.000034	.....	.....	
11,000	44,000	.001400	.000033	.....	.....	
11,250	45,000	.001467	.000067	.....	.....	Elastic limit.
11,500	46,000	.001567	.000100	.....	.....	
11,750	47,000	.004667	.003100	.....	.....	
12,000	48,000	.005500	.000833	.....	.....	
12,250	49,000	.006333	.000833	.....	.....	
12,500	50,000	.007500	.001167	.....	.....	
22,070	88,280	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	88,280
Elastic limit per square inch of original section	do...	45,000
Elongation per inch after rupture	inch..	.1800
Elongation per inch under strain at elastic limit	do...	.001467
Reduction in diameter at point of rupture	do...	.084
Reduction in area after rupture, per cent of original section		27.6
Position of rupture		1″.2 from neck
Character of broken surface		granular, dull spot at the circumference
Elongation of inch sections		″.12, ″.25*, ″.17

TUBE No. 11.

No. 4784.

Marks, $\frac{S\ R_{II}\ T}{M\ T_{I}\ O}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000333	.000233	.....	.....	
5,000	20,000	.000633	.000300	.....	.....	
7,500	30,000	.000967	.000334	.....	.....	
8,750	35,000	.001133	.000166	0.	.....	
9,750	39,000	.001333	.000200	.....	.....	Elastic limit.
10,000	40,000	.001700	.000367	.....	.....	
10,250	41,000	.002667	.000967	.....	.....	
10,500	42,000	.008967	.006300	.....	.....	
10,750	43,000	.009367	.000400	.....	.....	
11,000	44,000	.010567	.001200	.....	.....	
19,720	78,880	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	78,880
Elastic limit per square inch of original section	do...	39,000
Elongation per inch after rupture	inch..	.2533
Elongation per inch under strain at elastic limit	do....	.001333
Reduction in diameter at point of rupture	do....	.144
Reduction in area after rupture, per cent of original section		44.6
Position of rupture		1″.3 from neck
Character of broken surface		silky, serrated
Elongation of inch sections		″.16, ″.28*, ″.32*

TUBE No. 12.

No. 4808.

Marks, $\frac{8\ R_{13}\ T}{B\ T_1\ O}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.001000	.000367	.....	.....	
8,750	35,000	.001133	.000133	0.	.....	
10,000	40,000	.001300	.000167	.....	.....	
10,500	42,000	.001367	.000067	.000033	.000033	
10,750	43,000	.001433	.000066	.....	.....	
11,000	44,000	.001500	.000067	.....	.....	
11,250	45,000	.001533	.000033	.....	.....	
11,500	46,000	.001600	.000067	.....	.....	
11,750	47,000	.001633	.000033	.....	.....	
12,000	48,000	.001667	.000034	.....	.....	
12,250	49,000	.001700	.000033	.....	.....	Elastic limit.
12,500	50,000	.003100	.001400	.....	.....	
12,750	51,000	.005667	.002567	.....	.....	
13,000	52,000	.007333	.001666	.....	.....	
13,250	53,000	.008000	.000667	.....	.....	
13,500	54,000	.009167	.001167	.....	.....	
22,180	88,720	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	88,720
Elastic limit per square inch of original section	do...	49,000
Elongation per inch after rupture	inch..	.2133
Elongation per inch under strain at elastic limit	do...	.001700
Reduction in diameter at point of rupture	do...	.144
Reduction in area after rupture, per cent of original section		44.6
Position of rupture		1″.14 from neck
Character of broken surface		silky
Elongation of inch sections		″.31, ″.22, ″.11

TUBE No. 12.

No. 4809.

Marks, $\frac{8\ R_{12}\ T}{M\ T_4\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	.....	
2,500	10,000	.000300	.000233	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000967	.000334	.....	.....	
8,750	35,000	.001133	.000166	0.	.....	
10,000	40,000	.001300	.000167	.....	.....	
10,500	42,000	.001367	.000067	0.	.....	
10,750	43,000	.001400	.000033	.....	.....	
11,000	44,000	.001467	.000067	.....	.....	Elastic limit.
11,250	45,000	.011867	.000400	.....	.....	
11,500	46,000	.013000	.001133	.....	.....	
11,750	47,000	.013567	.000567	.....	.....	
12,000	48,000	.014167	.000600	.....	.....	
12,250	49,000	.015000	.000833	.....	.....	
21,600	86,400	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	86,400
Elastic limit per square inch of original section	do...	44,000
Elongation per inch after rupture	inch..	.1800
Elongation per inch under strain at elastic limit	do...	.001467
Reduction in diameter at point of rupture	do...	.054
Reduction in area after rupture, per cent of original section		18.3
Position of rupture		1″.3 from neck
Character of broken surface		granular; opened cracks in surface of the stem
Elongation of inch sections		″.17, ″.23*, ″.14

TUBE No. 13.

No. 4846.

Marks, $\frac{8\ R_1;\ T}{B\ T_1\ 0}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	.....	.....	
2,500	10,000	.000300	.000233	.....	.....	
5,000	20,000	.000600	.000300	.....	.....	
7,500	30,000	.000933	.000333	.....	.....	
8,750	35,000	.001100	.000167	.....	.....	
10,000	40,000	.001300	.000200	.....	.....	
10,500	42,000	.001400	.000100	.....	.....	
10,750	43,000	.001467	.000067	.....	.....	Elastic limit.
11,000	44,000	.004500	.003033	.....	.....	
11,250	45,000	.005500	.001000	.....	.....	
11,500	46,000	.006833	.001333	.....	.....	
11,750	47,000	.007733	.000900	.....	.....	
12,000	48,000	.008833	.001100	.....	.....	
20,390	81,560	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	81,560
Elastic limit per square inch of original section	do...	43,000
Elongation per inch after rupture	inch..	.2333
Elongation per inch under strain at elastic limit	do...	.001467
Reduction in diameter at point of rupture	do...	.154
Reduction in area after rupture, per cent of original section		47.2
Position of rupture		1″.6 from neck
Character of broken surface		silky, serrated
Elongation of inch sections		″.18, ″.39*, ″.13

No. 4847.

Marks, $\overset{8\,R}{\cdot}{}_{M\,T}{}^{1\,T}_{1\,O}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	.....	
2,500	10,000	.000300	.000233	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000933	.000300	.....	.....	
8,750	35,000	.001133	.000200	0.	.....	
10,000	40,000	.001300	.000167	.....	.....	
10,500	42,000	.001367	.000067	0.	.....	
10,750	43,000	.001400	.000033	.....	.....	
11,000	44,000	.001433	.000033	.....	.....	
11,250	45,000	.001467	.000034	.....	.....	Elastic limit.
11,500	46,000	.002333	.000866	.....	.....	
11,750	47,000	.009333	.007000	.....	.....	
12,000	48,000	.010667	.001334	.....	.....	
12,250	49,000	.011633	.000966	.....	.....	
12,500	50,000	.012333	.000700	.....	.....	
20,510	82,040	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	82,040
Elastic limit per square inch of original section	do...	45,000
Elongation per inch after rupture	inch..	.2200
Elongation per inch under strain at elastic limit	do...	.001467
Reduction in diameter at point of rupture	do...	.134
Reduction in area after rupture, per cent of original section		41.9
Position of rupture		1″ from neck
Character of broken surface		silky, serrated
Elongation of inch sections		″.13, ″.19, ″.34*

TUBE NO. 14.

No. 4858.

Marks, $\frac{8\ B_{14}\ T}{B\ T_1\ O}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	.....	
2,500	10,000	.000267	.000200	.....	.....	
5,000	20,000	.000600	.000333	.....	.....	
7,500	30,000	.000933	.000333	.....	.....	
8,750	35,000	.001100	.000167	0.	.....	
10,000	40,000	.001267	.000167	.....	.....	
10,500	42,000	.001333	.000066	0.	.....	
10,750	43,000	.001367	.000034	.....	.....	
11,000	44,000	.001400	.000033	.....	.....	
11,250	45,000	.001433	.000033	.....	.....	
11,500	46,000	.001467	.000034	.....	.....	
11,750	47,000	.001500	.000033	.....	.....	
12,000	48,000	.001533	.000033	.....	.....	
12,250	49,000	.001600	.000067	.....	.....	
12,500	50,000	.001633	.000033	.....	.....	Elastic limit.
12,750	51,000	.009667	.008034	.....	.....	
13,000	52,000	.010500	.000833	.....	.....	
13,250	53,000	.011333	.000833	.....	.....	
13,500	54,000	.012500	.001167	.....	.....	
13,750	55,000	.013333	.000833	.....	.....	
21,910	87,640	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	87,640
Elastic limit per square inch of original section	do...	50,000
Elongation per inch after rupture	inch..	.2133
Elongation per inch under strain at elastic limit	do...	.001633
Reduction in diameter at point of rupture	do...	.104
Reduction in area after rupture, per cent of original section		33.5
Position of rupture		1".2 from neck
Character of broken surface		granular, 55 per cent; silky serrated, 45 per cent
Elongation of inch sections		".30*, ".22, ".12

No. 4859.

Marks, $\frac{8\ R_{14}\ T}{M\ T_1\ O}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	.....	
2,500	10,000	.000233	.000166	.....	.....	
5,000	20,000	.000567	.000334	.....	.....	
7,500	30,000	.000933	.000366	.....	.....	
8,750	35,000	.001100	.000167	0.	.....	
10,000	40,000	.001267	.000167	.....	.....	
10,500	42,000	.001333	.000066	0.	.....	
10,750	43,000	.001333	0.	.....	.....	
11,000	44,000	.001367	.000034	.....	.....	
11,250	45,000	.001400	.000033	.....	.....	
11,500	46,000	.001433	.000033	.....	.....	
11,750	47,000	.001500	.000067	.....	.....	
12,000	48,000	.001533	.000033	.....	.....	Elastic limit.
12,250	49,000	.012500	.010967	.....	.....	
12,500	50,000	.013167	.000667	.....	.....	
12,750	51,000	.013833	.000666	.....	.....	
13,000	52,000	.014667	.000834	.....	.....	
13,250	53,000	.015667	.001000	.....	.....	
22,810	91,240	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,240
Elastic limit per square inch of original section	do ..	48,000
Elongation per inch after rupture	inch..	.1867
Elongation per inch under strain at elastic limit	do...	.001533
Reduction in diameter at point of rupture	do...	.064
Reduction in area after rupture, per cent of original section		21.4
Position of rupture		1″.8 from neck
Character of broken surface		granular, 70 per cent; silky, 30 per cent
Elongation of inch sections		″.17, ″.23*, ″.16

TUBE No. 15.

No. 4866.

Marks, $\frac{8\ R_1\ T}{B\ T_1\ O}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	.....	
2,500	10,000	.000267	.000200	.....	.....	
5,000	20,000	.000567	.000300	.....	.....	
7,500	30,000	.000933	.000366	.....	.....	
8,750	35,000	.001100	.000167	0.	.....	
10,000	40,000	.001267	.000167	.....	.....	
10,500	42,000	.001333	.000066	0.	.....	
10,750	43,000	.001367	.000034	.....	.....	
11,000	44,000	.001400	.000033	.....	.....	
11,250	45,000	.001433	.000033	.....	.....	
11,500	46,000	.001467	.000034	.....	.....	
11,750	47,000	.001500	.000033	.....	.....	Elastic limit.
12,000	48,000	.003300	.001800	.....	.....	
12,250	49,000	.004667	.001367	.....	.....	
12,500	50,000	.006500	.001833	.....	.....	
12,750	51,000	.007667	.001167	.....	.....	
13,000	52,000	.009000	.001333	.....	.....	
21,310	85,240	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	85,240
Elastic limit per square inch of original section	do...	47,000
Elongation per inch after rupture	inch..	.1733
Elongation per inch under strain at elastic limit	do...	.001500
Reduction in diameter at point of rupture	do...	.124
Reduction in area after rupture, per cent of original section		39.2
Position of rupture		″.8 from neck
Character of broken surface		silky
Elongation of inch sections		″.08, ″.13, ″.31*

TUBE No. 15.

No. 4867.

Marks, $\frac{8\,R_{II}\,T}{M\,T_{I}\,O}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.001000	.000367	.....	.....	
8,750	35,000	.001167	.000167	0.	.....	
10,000	40,000	.001367	.000200	.....	.....	
10,500	42,000	.001433	.000066	0.	.....	
10,750	43,000	.001500	.000067	.....	.....	
11,000	44,000	.001567	.000067	.....	.....	
11,250	45,000	.001600	.000033	.....	.....	Elastic limit.
11,500	46,000	.012667	.011067	.....	.....	
11,750	47,000	.013733	.001066	.....	.....	
12,000	48,000	.014367	.000634	.....	.....	
12,250	49,000	.015367	.001000	.....	.....	
12,500	50,000	.016333	.000966	.....	.....	
21,480	85,920	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	85,920
Elastic limit per square inch of original section	do...	45,000
Elongation per inch after rupture	inch..	.1967
Elongation per inch under strain at elastic limit	do...	.001600
Reduction in diameter at point of rupture	do...	.074
Reduction in area after rupture, per cent of original section		24.6
Position of rupture		″.9 from neck
Character of broken surface		granular, 70 per cent; silky, serrated, 30; opened cracks in surface of stem.
Elongation of inch sections		″.22*, ″.21, ″.16

TUBE NO. 16.

No. 4870.

Marks, $\frac{8\ R_{16}\ T}{B\ T_1\ O}$
Diameter, ".564.
Sectional area .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000333	.000233	.....	.....	
5,000	20,000	.000667	.000334	.....	.....	
7,500	30,000	.001000	.000333	.....	.....	
8,750	35,000	.001200	.000200	0.	.....	
10,000	40,000	.001400	.000200	.....	.....	
10,500	42,000	.001567	.000167	.000067	.000067	Elastic limit.
10,750	43,000	.001700	.000133	.....	.....	
11,000	44.000	.002033	.000333	.....	.....	
11,250	45,000	.003167	.001134	.....	.....	
11,500	46,000	.005000	.001833	.....	.....	
11,750	47,000	.005900	.000900	.....	.....	
21,390	85,560	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	85,560
Elastic limit per square inch of original section	do...	42,000
Elongation per inch after rupture	inch..	.1533
Elongation per inch under strain at elastic limit	do...	.001567
Reduction in diameter at point of rupture	do...	.044
Reduction in area after rupture, per cent of original section		15.0
Position of rupture		".8 from neck
Character of broken surface		granular; flaky spot at circumference; opened cracks in surface of stem.
Elongation of inch sections		".14, ".20*, ."12

TUBE NO. 16.

No. 4871.

Marks, $\frac{8\ R_{16}\ T}{M\ T_1\ O}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000667	.000367	.....	.....	
7,500	30,000	.001000	.000333	.....	.....	
8,750	35,000	.001200	.000200	0.	.....	
10,000	40,000	.001400	.000200	.....	.....	
10,250	41,000	.001467	.000067	.....	.....	Elastic limit.
10,500	42,000	.001600	.000133	.000267	.000267	
10,750	43,000	.011667	.010067	.....	.....	
11,000	44,000	.012333	.000666	.....	.....	
11,250	45,000	.013333	.001000	.....	.....	
11,500	46,000	.014000	.000667	.....	.....	
11,750	47,000	.014733	.000733	.....	.....	
21,020	84,080	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds...	84,080
Elastic limit per square inch of original section	do...	41,000
Elongation per inch after rupture	inch..	.2333
Elongation per inch under strain at elastic limit	do...	.001467
Reduction in diameter at point of rupture	do...	.104
Reduction in area after rupture, per cent of original section		33.5
Position of rupture		1″.40 from neck
Character of broken surface		silky; 60 per cent of surface interspersed with fine granulation
Elongation of inch sections		.″23, ″.29*, ″.18

JACKET No. 2.

No. 4892.

Marks, $\frac{8\,R\,B_2\,J}{B\,T_2\,M}$
Diameter, ″.565.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000333	.000233	.....	.....	
5,000	20,000	.000667	.000334	.....	.....	
7,500	30,000	.000967	.000300	.....	.....	
10,000	40,000	.001300	.000333	0.	.....	
11,000	44,000	.001433	.000133	0.	.....	
11,250	45,000	.001467	.000034	.....	.....	
11,500	46,000	.001533	.000066	.....	.....	
11,750	47,000	.001600	.000067	.....	.....	
12,000	48,000	.001633	.000033	.....	.....	
12,250	49,000	.001667	.000034	.....	.....	
12,500	50,000	.001733	.000066	.....	.....	Elastic limit.
12,750	51,000	.005500	.003767	.....	.....	
13,000	52,000	.006667	.001167	.....	.....	
13,250	53,000	.007333	.000666	.....	.....	
13,500	54,000	.008167	.000834	.....	.....	
13,750	55,000	.009167	.001000	.....	.....	
22,970	91,880	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,880
Elastic limit per square inch of original section	do...	50,000
Elongation per inch after rupture	inch..	.2200
Elongation per inch under strain at elastic limit	do...	.001733
Reduction in diameter at point of rupture	do...	.155
Reduction in area after rupture, per cent of original section		47.2
Position of rupture		1″ from neck
Character of broken surface		silky
Elongation of inch sections		″.11, ″.20, ″.35*

No. 4891.

Marks, $\frac{S\ R\ B_2\ J}{M\ T_2\ M}$
Diameter, ″.565.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000333	.000233	.....	.....	
5,000	20,000	.000667	.000334	.....	.....	
7,500	30,000	.001000	.000333	.....	.....	
10,000	40,000	.001333	.000333	0.	.....	
11,000	44,000	.001500	.000167	.000033	.000033	
11,250	45,000	.001567	.000067	.....	.....	
11,500	46,000	.001600	.000033	.....	.....	
11,750	47,000	.001633	.000033	.....	.....	
12,000	48,000	.001667	.000034	.....	.....	Elastic limit.
12,250	49,000	.001967	.000300	.....	.....	
12,500	50,000	.003667	.001700	.....	.....	
12,750	51,000	.004667	.001000	.....	.....	
13,000	52,000	.005667	.001000	.....	.....	
13,250	53,000	.007000	.001333	.....	.....	
22,890	91,560	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,560
Elastic limit per square inch of original section	.do...	48,000
Elongation per inch after rupture	inch..	.2267
Elongation per inch under strain at elastic limit	do...	.001667
Reduction in diameter at point of rupture	do...	.154
Reduction in area after rupture, per cent of original section		47.2
Position of rupture		1″.5 from neck
Character of broken surface		silky
Elongation of inch sections		″.18, ″.36*, ″.14

JACKET No. 4.

No. 4894.

Marks, $\frac{S\,R\,B_1\,J}{B\,T,M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000333	.000200	.....	.....	
5,000	20,000	.000667	.000334	.....	.....	
7,500	30,000	.001000	.000333	.....	.....	
10,000	40,000	.001333	.000333	.000033	.000033	
11,000	44,000	.001433	.000100	.000033	0.	
11,250	45,000	.001500	.000067	.....	.....	
11,500	46,000	.001600	.000100	.....	.....	
11,750	47,000	.001633	.000033	.....	.....	
12,000	48,000	.001667	.000034	.....	.....	
12,250	49,000	.001700	.000033	.....	.....	Elastic limit.
12,500	50,000	.006733	.005033	.....	.....	
12,750	51,000	.007833	.001100	.....	.....	
13,000	52,000	.008500	.000667	.....	.....	
13,250	53,000	.009333	.000833	.....	.....	
13,500	54,000	.010500	.001167	.....	.....	
22,070	88,280	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	88,280
Elastic limit per square inch of original section	do...	49,000
Elongation per inch after rupture	inch..	.2300
Elongation per inch under strain at elastic limit	do...	.001700
Reduction in diameter at point of rupture	do...	.174
Reduction in area after rupture, per cent of original section		52.2
Position of rupture		1".6 from neck
Character of broken surface		silky
Elongation of inch sections		".13, ".41*, ".15

No. 4893.

Marks, $\frac{8\ R\ B_4\ J}{M\ T_2\ M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000300	.000167	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000967	.000334	.....	.....	
10,000	40,000	.001300	.000333	0.	.....	
11,000	44,000	.001433	.000133	0.	.....	
11,250	45,000	.001500	.000067	.....	.....	
11,500	46,000	.001567	.000067	.....	.....	
11,750	47,000	.001633	.000066	.....	.....	
12,000	48,000	.001667	.000034	.....	.....	Elastic limit.
12,250	49,000	.003667	.002000	.....	.....	
12,500	50,000	.006000	.002333	.....	.....	
12,750	51,000	.007000	.001000	.....	.....	
13,000	52,000	.008000	.001000	.....	.....	
13,250	53,000	.009500	.001500	.....	.....	
21,610	86,440	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	86,440
Elastic limit per square inch of original section	do...	48,000
Elongation per inch after rupture	inch..	.2233
Elongation per inch under strain at elastic limit	do...	.001667
Reduction in diameter at point of rupture	do...	.164
Reduction in area after rupture, per cent of original section		49.7
Position of rupture		1".5 from neck
Character of broken surface		silky
Elongation of inch sections		".20, ".32*, ".15

JACKET No. 11.

No. 4758.

Marks, $\frac{8\ R_{II}\ J}{B\ T,\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000333	.000200	.....	.....	
5,000	20,000	.000667	.000334	.....	.....	
7,500	30,000	.001000	.000333	.....	.....	
10,000	40,000	.001400	.000400	.....	.....	
10,250	41,000	.001433	.000033	.....	.....	
10,500	42,000	.001467	.000034	.....	.....	Elastic limit.
10,750	43,000	.001567	.000100	.....	.....	
11,000	44,000	.001700	.000133	.000300	.000300	
11,250	45,000	.001833	.000133	.....	.....	
11,500	46,000	.002133	.000300	.....	.....	
11,750	47,000	.002800	.000667	.....	.....	
12,000	48,000	.003767	.000967	.....	.....	
12,250	49,000	.004667	.000900	.....	.....	
12,500	50,000	.006367	.001700	.....	.....	
21,860	87,440	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	87,440
Elastic limit per square inch of original section	do...	42,000
Elongation per inch after rupture	inch..	.233
Elongation per inch under strain at elastic limit	do...	.001467
Reduction in diameter at point of rupture	do...	.164
Reduction in area after rupture, per cent of original section		49.7
Position of rupture		1″.8 from neck
Character of broken surface		silky
Elongation of inch sections		″.14, ″.42*, ″.14

No. 4757.

Marks, $\frac{8\,R_{II}\,J}{M\,T_2\,M}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000967	.000334	.....	.....	
10,000	40,000	.001367	.000400	0.	.....	
11,000	44,000	.001567	.000200	.000033	.000033	
11,250	45,000	.001600	.000033	.....	.....	
11,500	46,000	.001633	.000033	.....	.....	
11,750	47,000	.001633	0.	.....	.....	
12,000	48,000	.001667	.000034	.....	.....	
12,250	49,000	.001700	.000033	.....	.....	
12,500	50,000	.001767	.000067	.....	.....	Elastic limit.
12,750	51,000	.001867	.000100	.....	.....	
13,000	52,000	.002000	.000133	.....	.....	
13,250	53,000	.002333	.000333	.....	.....	
13,500	54,000	.003733	.001400	.....	.....	
13,750	55,000	.004833	.001100	.....	.....	
23,370	93,480	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	93,480
Elastic limit per square inch of original section	do...	50,000
Elongation per inch after rupture	inch..	.213
Elongation per inch under strain at elastic limit	do...	.001767
Reduction in diameter at point of rupture	do...	.144
Reduction in area after rupture, per cent of original section		44.6
Position of rupture		1″.25 from neck
Character of broken surface		silky
Elongation of inch sections		″.20, ″.30, ″.14

JACKET No. 12.

No. 4515.

Marks, $\frac{8\ E_{1}\ J}{B\ T,\ O}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000333	.000233	.....	.....	
5,000	20,000	.000667	.000334	.....	.....	
7,500	30,000	.001000	.000333	.....	.....	
10,000	40,000	.001333	.000333	0.	.....	
11,000	44,000	.001433	.000100	0.	.....	
11,250	45,000	.001500	.000067	.....	.....	
11,500	46,000	.001533	.000033	.....	.....	
11,750	47,000	.001600	.000067	.....	.....	Elastic limit.
12,000	48,000	.002300	.000700	.....	.....	
12,250	49,000	.003300	.001000	.....	.....	
12,500	50,000	.005167	.001867	.....	.....	
12,750	51,000	.006600	.001433	.....	.....	
13,000	52,000	.007667	.001067	.....	.....	
21,390	85,560	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	85,560
Elastic limit per square inch of original section	do...	47,000
Elongation per inch after rupture	inch..	.2367
Elongation per inch under strain at elastic limit	do...	.001600
Reduction in diameter at point of rupture	do...	.144
Reduction in area after rupture, per cent of original section		44.6
Position of rupture		1″.8 from neck
Character of broken surface		silky
Elongation of inch sections		″.13, ″.43*, ″.15

No. 4814.

Marks, $^{8}_{M}R_{T}^{I}{}_{O}^{J}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000333	.000233	.....	.....	
5,000	20,000	.000700	.000367	.....	.....	
7,500	30,000	.001033	.000333	.....	.....	
10,000	40,000	.001400	.000367	.000067	.000067	
10,500	42,000	.001467	.000067	.....	.....	
10,750	43,000	.001533	.000066	.....	.....	Elastic limit.
11,000	44,000	.010133	.008600	.008333	.008266	
11,250	45,000	.010600	.000467	.....	.....	
11,500	46,000	.011000	.000400	.....	.....	
11,750	47,000	.011800	.000800	.....	.....	
12,000	48,000	.012600	.000800	.....	.....	
22,520	90,080	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	90,800
Elastic limit per square inch of original section	do...	43,000
Elongation per inch after rupture	inch..	.1833
Elongation per inch under strain at elastic limit	do...	.001533
Reduction in diameter at point of rupture	do. .	.104
Reduction in area after rupture, per cent of original section		33.5
Position of rupture		1".4 from neck
Character of broken surface		granular, 80 per cent; silky, 20 per cent
Elongation of inch sections		".15, ".26*, ".14

JACKET No. 13.

No. 4856.

Marks, $\frac{8\ E_{18}\ J}{B\ T_{1}\ O}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000600	.000300	.....	.....	
7,500	30,000	.000933	.000333	.....	.....	
10,000	40,000	.001300	.000367	0.	.....	
11,000	44,000	.001433	.000133	0.	.....	
11,250	45,000	.001467	.000034	.....	.....	
11,500	46,000	.001500	.000033	.....	.....	
11,750	47,000	.001533	.000033	.....	.....	
12,000	48,000	.001567	.000034	.....	.....	
12,250	49,000	.001633	.000066	.....	.....	
12,500	50,000	.001667	.000034	.....	.....	
12,750	51,000	.001700	.000033	.....	.....	
13,000	52,000	.001733	.000033	.....	.....	
13,250	53,000	.001767	.000034	.....	.....	
13,500	54,000	.001800	.000033	.....	.....	
13,750	55,000	.001833	.000033	.....	.....	
14,000	56,000	.001867	.000034	.....	.....	
14,250	57,000	.001900	.000033	.....	.....	Elastic limit.
14,500	58,000	.002400	.000500	.....	.....	
14,750	59,000	.006167	.003767	.....	.....	
15,000	60,000	.007667	.001500	.....	.....	
15,250	61,000	.008667	.001000	.....	.....	
15,500	62,000	.009500	.000833	.....	.....	
24,210	96,840	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	96,840
Elastic limit per square inch of original section	do...	57,000
Elongation per inch after rupture	inch..	.2067
Elongation per inch under strain at elastic limit	do...	.001900
Reduction in diameter at point of rupture	do...	.154
Reduction in area after rupture, per cent of original section		47.3
Position of rupture		1".3 from neck
Character of broken surface		silky
Elongation of inch sections		".26*, ".24*, ".12

No. 4857.

Marks, $\frac{8 B_{M T}^{R J}}{O}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	.....	
2,500	10,000	.000267	.000200	.....	.....	
5,000	20,000	.000600	.000333	.....	.....	
7,500	30,000	.000933	.000333	.....	.....	
10,000	40,000	.001267	.000334	0.	.....	
11,000	44,000	.001400	.000133	0.	.....	
11,250	45,000	.001433	.000033	.....	.....	
11,500	46,000	.001500	.000067	.....	.....	Elastic limit.
11,750	47,000	.009333	.007833	.....	.....	
12,000	48,000	.009833	.000500	.....	.....	
12,250	49,000	.010333	.000500	.....	.....	
12,500	50,000	.011000	.000667	.....	.....	
12,750	51,000	.011667	.000667	.....	.....	
23,510	94,040	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	94,040
Elastic limit per square inch of original section	do...	46,000
Elongation per inch after rupture	inch..	.2000
Elongation per inch under strain at elastic limit	do...	.001500
Reduction in diameter at point of rupture	do...	.104
Reduction in area after rupture, per cent of original section		33.5
Position of rupture		1".7 from neck
Character of broken surface		silky, slightly granular near the circumference
Elongation of inch sections		".14, ".31*, ".15

JACKET No. 14.

No. 4868.

Marks, $\frac{8\ E_{14}\ J}{B\ T_1\ O}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	.....	
2,500	10,000	.000300	.000233	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000967	.000334	.....	.....	
10,000	40,000	.001300	.000333	0.	.....	
11,000	44,000	.001400	.000100	0.	.....	
11,250	45,000	.001433	.000033	.....	.....	
11,500	46,000	.001467	.000034	.....	.....	
11,750	47,000	.001500	.000033	.....	.....	
12,000	48,000	.001533	.000033	.....	.....	
12,250	49,000	.001567	.000034	.....	.....	
12,500	50,000	.001633	.000066	.....	.....	
12,750	51,000	.001667	.000034	.....	.....	
13,000	52,000	.001700	.000033	.....	.....	
13,250	53,000	.001733	.000033	.....	.....	
13,500	54,000	.001767	.000034	.....	.....	
13,750	55,000	.001800	.000033	.....	.....	
14,000	56,000	.001833	.000033	.....	.....	
14,250	57,000	.001867	.000034	.....	.....	Elastic limit.
14,500	58,000	.001967	.000100	.....	.....	
44,750	59,000	.002067	.000100	.....	.....	
15,000	60,000	.002367	.000300	.....	.....	
15,250	61,000	.002933	.000566	.....	.....	
15,500	62,000	.004000	.001067	.....	.....	
25,610	102,440	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	102,440
Elastic limit per square inch of original section	do...	57,000
Elongation per inch after rupture	inch..	.1700
Elongation per inch under strain at elastic limit	do...	.001867
Reduction in diameter at point of rupture	do...	.124
Reduction in area after rupture, per cent of original section		89.2
Position of rupture		1″.1 from neck
Character of broken surface		granular, 50 per cent; dull silky, 50 per cent
Elongation of inch sections		″.09, ″.15, ″.27

No. 4869.

Marks, $\frac{8\,R_{14}\,J}{M\,T_1\,O}$.
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000333	.000233	.....	.....	
5,000	20,000	.000667	.000334	.....	.....	
7,500	30,000	.001000	.000333	.....	.....	
10,000	40,000	.001333	.000333	0.	.....	
11,000	44,000	.001500	.000167	.000033	.000033	Elastic limit.
11,250	45,000	.001633	.000133	.....	.....	
11,500	46,000	.011933	.010300	.....	.....	
11,750	47,000	.013000	.001067	.....	.....	
12,000	48,000	.013833	.000833	.....	.....	
12,250	49,000	.015000	.001167	.....	.....	
20,120	80,480	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	80,480
Elastic limit per square inch of original section	do....	44,000
Elongation per inch after rupture	inch..	.2400
Elongation per inch under strain at elastic limit	do....	.001500
Reduction in diameter at point of rupture	do....	.154
Reduction in area after rupture, per cent of original section		47.2
Position of rupture		1" from neck
Character of broken surface		silky
Elongation of inch sections		".15, ".22, ".35*

JACKET No. 17.

No. 4876.

Marks, $\frac{8\ R_T\ J}{B\ T_1\ O}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000160	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.001000	.000367	.....	.....	
10,000	40,000	.001333	.000333	0.	.....	
11,000	44,000	.001500	.000167	0.	.....	
11,250	45,000	.001533	.000033	.....	.....	
11,500	46,000	.001600	.000067	.....	.....	
11,750	47,000	.001633	.000033	.....	.....	
12,000	48,000	.001667	.000034	.....	.....	
12,250	49,000	.001700	.000033	.....	.....	
12,500	50,000	.001767	.000067	.....	.....	Elastic limit.
12,750	51,000	.001867	.000100	.....	.....	
13,000	52,000	.002033	.000166	.....	.....	
13,250	53,000	.003067	.001034	.....	.....	
13,500	54,000	.004833	.001766	.....	.....	
13,750	55,000	.006167	.001334	.....	.....	
23,660	94,640	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	94,640
Elastic limit per square inch of original section	do...	50,000
Elongation per inch after rupture	inch..	.1600
Elongation per inch under strain at elastic limit	do...	.001767
Reduction in diameter at point of rupture	do...	.074
Reduction in area after rupture, per cent of original section		24.6
Position of rupture		1".3 from neck
Character of broken surface		granular, radiating from a flaky spot at the circumference; opened cracks in surface of stem.
Elongation of inch sections		".10, ".19*, ".19*

No. 4877.

Marks, $\frac{8\,R_W\,J}{M\,T_1\,O}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000967	.000334	.....	.....	
10,000	40,000	.001333	.000366	0.	.....	
11,000	44,000	.001433	.000100	0.	.....	
11,250	45,000	.001467	.000034	.....	.....	
11,500	46,000	.001500	.000033	.....	.....	
11,750	47,000	.001533	.000033	.....	.....	
12,000	48,000	.001567	.000034	.....	.....	
12,250	49,000	.001633	.000066	.....	.....	
12,500	50,000	.001667	.000034	.....	.....	
12,750	51,000	.001700	.000033	.....	.....	
13,000	52,000	.001733	.000033	.....	.....	Elastic limit.
13,250	53,000	.004000	.002267	.....	.....	
13,500	54,000	.005333	.001333	.....	.....	
13,750	55,000	.007333	.002000	.....	.....	
14,000	56,000	.009000	.001667	.....	.....	
14,250	57,000	.010333	.001333	.....	.....	
23,210	92,840	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds.:	92,840
Elastic limit per square inch of original section	do...	52,000
Elongation per inch after rupture	inch..	.1800
Elongation per inch under strain at elastic limit	do...	.001733
Reduction in diameter at point of rupture	do...	.124
Reduction in area after rupture, per cent of original section		39.2
Position of rupture		1" from neck
Character of broken surface		granular, 60 per cent; silky, 40 per cent
Elongation of inch sections		".30, ".15, ".09

JACKET No. 20.

No. 4884.

Marks, $\frac{S\ B_P\ J}{B\ T_{11}}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000367	.000267	.....	.....	
5,000	20,000	.000700	.000333	.....	.....	
7,500	30,000	.001033	.000333	.....	.....	
10,000	40,000	.001400	.000367	0.	.....	
11,000	44,000	.001600	.000200	0.	.....	
11,250	45,000	.001633	.000033	.....	.....	
11,500	46,000	.001667	.000034	.....	.....	
11,750	47,000	.001667	0.	.....	.....	
12,000	48,000	.001667	0.	.....	.....	
12,250	49,000	.001700	.000033	.....	.....	
12,500	50,000	.001700	0.	.....	.....	
12,750	51,000	.001733	.000033	.....	.....	
13,000	52,000	.001800	.000067	.....	.....	
13,250	53,000	.001900	.000100	.....	.....	
13,500	54,000	.001933	.000033	.....	.....	
13,750	55,000	.001967	.000034	.....	.....	
14,000	56,000	.002000	.000033	.....	.....	
14,250	57,000	.002033	.000033	.....	.....	
14,500	58,000	.002067	.000034	.....	.....	Elastic limit.
14,750	59,000	.002167	.000100	.....	.....	
15,000	60,000	.002333	.000166	.....	.....	
15,250	61,000	.002667	.000334	.....	.....	
15,500	62,000	.003367	.000700	.....	.....	
15,750	63,000	.004633	.001266	.....	.....	
26,400	105,600	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	105,600
Elastic limit per square inch of original section	do...	58,000
Elongation per inch after rupture	inch..	.1767
Elongation per inch under strain at elastic limit	do...	.002067
Reduction in diameter at point of rupture	do...	.124
Reduction in area after rupture, per cent of original section		39.2
Position of rupture		1". 30 from neck
Character of broken surface		silky, 50 per cent; granular, 50 per cent
Elongation of inch sections		".16, ".26*, ".11

No. 4885.

Marks, $^{8}_{M}R_{T}^{J}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000033	.000033	0.	.....	
2,500	10,000	.000267	.000234	.....	.....	
5,000	20,000	.000600	.000333	.....	.....	
7,500	30,000	.000933	.000333	.....	.....	
10,000	40,000	.001267	.000334	0.	.....	
11,000	44,000	.001367	.000100	0.	.....	
11,250	45,000	.001367	0.	.....	.....	
11,500	46,000	.001400	.000033	.....	.....	
11,750	47,000	.001433	.000033	.....	.....	
12,000	48,000	.001600	.000167	.....	.....	
12,250	49,000	.001633	.000033	.....	.....	
12,500	50,000	.001633	0.	.....	.....	
12,750	51,000	.001667	.000034	.....	.....	Elastic limit.
13,000	52,000	.001767	.000100	.....	.....	
13,250	53,000	.002733	.000966	.....	.....	
13,500	54,000	.004067	.001334	.....	.....	
13,750	55,000	.005100	.001033	.....	.....	
14,000	56,000	.006600	.001500	.....	.....	
14,250	57,000	.007633	.001033	.....	.....	
22,900	91,600	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,600
Elastic limit per square inch of original section	do...	51,000
Elongation per inch after rupture	inch..	.2067
Elongation per inch under strain at elastic limit	do...	.001667
Reduction in diameter at point of rupture	do...	.134
Reduction in area after rupture, per cent of original section		41.9
Position of rupture		1″.70 from neck
Character of broken surface		silky, 90 per cent; granular, 10 per cent
Elongation of inch sections		″.16, ″.34, ″.12

TABULATION OF TENSION SPECIMENS FROM 8-INCH STEEL B. L. RIFLES.

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Contraction of area.	Appearance of fracture.
			Pounds.	*Pounds.*	*Per ct.*	*Per ct.*	
4890	Tube No. 2....	Middle ...	47,000	87,280	21.3	47.2	Silky.
4889	.....do.....	.....do	47,000	82,840	24.0	44.6	Do.
4783	Tube No. 11...	Outside...	45,000	88,280	18.0	27.6	Granular, dull spot at circumference.
4784	.....do.....	.....do	39,000	78,880	25.3	44.6	Silky, serrated.
4808	Tube No. 12...	.....do	49,000	88,720	21.3	44.6	Silky.
4809	.....do.....	Middle ...	44,000	86,400	18.0	18.3	Granular.
4846	Tube No. 13...	Outside...	43,000	81,560	23.3	47.2	Silky, serrated.
4847	.....do.....	.....do	45,000	82,040	22.0	41.9	Do.
4858	Tube No. 14...	.....do	50,000	87,640	21.3	33.5	Granular 55 per cent, silky serrated 45 per cent.
4859	.....do.....	.....do	48,000	91,240	18.7	21.4	Granular 70 per cent, silky 30 per cent.
4866	Tube No. 15...	.....do	47,000	85,240	17.3	39.2	Silky.
4867	.....do.....	.....do	45,000	85,920	19.7	24.6	Granular 70 per cent, silky serrated 30 per cent.
4870	Tube No. 16...	.....do	42,000	85,560	15.3	15.0	Granular, flaky spot.
4871	.....do.....	.....do	41,000	84,080	23.3	33.5	Silky and fine granular.
4892	Jacket No. 2..	Middle ...	50,000	91,880	22.0	47.2	Silky.
4891	.....do.....	.....do	48,000	91,560	22.7	47.2	Do.
4894	Jacket No. 4..	.....do	49,000	88,280	23.0	52.2	Do.
4893	.....do.....	.....do	48,000	86,440	22.3	49.7	Do.
4758	Jacket No. 11.	.....do	42,000	87,440	23.3	49.7	Do.
4757	.....do.....	.....do	50,000	93,480	21.3	44.6	Do.
4815	Jacket No. 12.	Outside...	47,000	85,560	23.7	44.6	Do.
4814	.....do.....	.....do	43,000	90,080	18.3	33.5	Granular 80 per cent, silky 20 per cent.
4856	Jacket No. 13.	.....do	57,000	96,840	20.7	47.2	Silky.
4857	.....do.....	.....do	46,000	94,040	20.0	33.5	Silky, slightly granular.
4868	Jacket No. 14.	.....do	57,000	102,440	17.0	39.2	Granular 50 per cent, dull silky 50 per cent.
4869	.....do.....	.....do	44,000	80,480	24.0	47.2	Silky.
4876	Jacket No. 17.	.....do	50,000	94,640	16.0	24.6	Granular, flaky spot.
4877	.....do.....	.....do	52,000	92,840	18.0	39.2	Granular 60 per cent, silky 40 per cent.
4884	Jacket No. 20.	.....do	58,000	105,600	17.7	39.2	Silky 50 per cent, granular 50 per cent.
4885	.....do.....	.....do	51,000	91,600	20.7	41.9	Silky 90 per cent, granular 10 per cent.

10-INCH STEEL B. L. RIFLES.

SPECIMENS FROM TUBES AND JACKETS.

TUBE No. 17.

No. 4806.

Marks, $\frac{10\ R_V T}{B\ T_, M}$
Diameter, ″.565.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000967	.000334	.....	.....	
8,750	35,000	.001167	.000200	.000033	.000033	
10,000	40,000	.001367	.000200	.000033	0.	
10,250	41,000	.001400	.000033	.....	.....	
10,500	42,000	.001433	.000033	.....	.....	
10,750	43,000	.001467	.000034	.....	.....	
11,000	44,000	001500	.000033	.....	.....	
11,250	45,000	.001525	.000025	.....	.....	
11,500	46,000	.001600	.000075	.....	.....	
11,750	47,000	.001633	.000033	.....	.....	
12,000	48,000	.001667	.000034	.....	.....	
12,250	49,000	.001700	.000033	.....	.....	
12,500	50,000	.001733	.000033	.....	.....	Elastic limit.
12,750	51,000	.001867	.000134	.....	.....	
13,000	52,000	.002333	.000466	.....	.....	
13,250	53,000	.003667	.001334	.....	.....	
13,500	54,000	.005167	.001500	.....	.....	
13,750	55,000	.006433	.001266	.....	.....	
23,010	92,040	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	92,040
Elastic limit per square inch of original section	do...	50,000
Elongation per inch after rupture	inch..	.2067
Elongation per inch under strain at elastic limit	do...	.001733
Reduction in diameter at point of rupture	do...	.135
Reduction in area after rupture, per cent of original section		41.9
Position of rupture		1″.7 from neck
Character of broken surface		silky
Elongation of inch sections		″.13, ″.34*, ″.15

No. 4805.

Marks, $\frac{10\ B_{IV}\ T}{M\ T,\ M}$
Diameter, ".565.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	.....	
2,500	10,000	.000300	.000233	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000967	.000334	.....	.....	
8,750	35,000	.001133	.000166	0.	.....	
10,000	40,000	.001333	.000200	.000033	.000033	
10,250	41,000	.001367	.000034	.....	.....	
10,500	42,000	.001400	.000033	.....	.....	
10,750	43,000	.001433	.000033	.....	.....	
11,000	44,000	.001500	.000067	.....	.....	
11,250	45,000	.001567	.000067	.....	.....	
11,500	46,000	.001600	.000033	.....	.....	
11,750	47,000	.001633	.000033	.....	.....	
12,000	48,000	.001667	.000034	.....	.....	
12,250	49,000	.001700	.000033	.....	.....	
12,500	50,000	.001733	.000033	.....	.....	Elastic limit.
12,750	51,000	.001833	.000100	.....	.....	
13,000	52,000	.002967	.001134	.....	.....	
13,250	53,000	.005300	.002333	.....	.....	
13,500	54,000	.006667	.001367	.....	.....	
13,750	55,000	.007667	.001000	.....	.....	
22,360	89,440	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	89,440
Elastic limit per square inch of original section	do...	50,000
Elongation per inch after rupture	inch..	.2467
Elongation per inch under strain at elastic limit	do...	.001733
Reduction in diameter at point of rupture	do...	.145
Reduction in area after rupture, per cent of original section		44.6
Position of rupture		1".65 from neck
Character of broken surface		silky
Elongation of inch sections		".16, ".39*, ".19

TUBE No. 21.

No. 4825.

Marks, $\frac{10\ B_{21}\ T}{B\ T_2\ M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000967	.000334	.....	.....	
8,750	35,000	.001133	.000166	0.	.....	
10,000	40,000	.001333	.000200	0.	.....	
10,250	41,000	.001367	.000034	.....	.....	
10,500	42,000	.001400	.000033	.....	.....	
10,750	43,000	.001433	.000033	.....	.....	
11,000	44,000	.001467	.000034	.....	.....	
11,250	45,000	.001500	.000033	.....	.....	
11,500	46,000	.001567	.000067	.....	.....	
11,750	47,000	.001600	.000033	.....	.....	Elastic limit.
12,000	48,000	.002000	.000400	.....	.....	
12,250	49,000	.003000	.001000	.....	.....	
12,500	50,000	.004000	.001000	.....	.....	
12,750	51,000	.004833	.000833	.....	.....	
13,000	52,000	.006000	.001167	.....	.....	
22,630	90,520	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	90,520
Elastic limit per square inch of original section	do...	47,000
Elongation per inch after rupture	inch..	.2067
Elongation per inch under strain at elastic limit	do...	.001600
Reduction in diameter at point of rupture	do...	.154
Reduction in area after rupture, per cent of original section		47.2
Position of rupture		at middle of stem
Character of broken surface		silky
Elongation of inch sections		".13, ".36*, ".13

No. 4824.

Marks, $\frac{10\ R_2,\ T}{M\ T,\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000667	.000367	.....	.....	
7,500	30,000	.001000	.000333	.....	.....	
8,750	35,000	.001167	.000167	0.	.....	
10,000	40,000	.001333	.000166	0.	.....	
10,250	41,000	.001367	.000034	.....	.....	
10,500	42,000	.001400	.000033	.....	.....	
10,750	43,000	.001433	.000033	.....	.....	
11,000	44,000	.001467	.000034	.....	.....	
11,250	45,000	.001500	.000033	.....	.....	
11,500	46,000	.001567	.000067	.....	.....	
11,750	47,000	.001633	.000066	.....	.....	
12,000	48,000	.001667	.000034	.....	.....	
12,250	49,000	.001700	.000033	.....	.....	Elastic limit.
12,500	50,000	.003000	.001300	.....	.....	
12,750	51,000	.005400	.002400	.....	.....	
13,000	52,000	.006667	.001267	.....	.....	
13,250	53,000	.007667	.001000	.....	.....	
13,500	54,000	.008500	.000833	.....	.....	
22,190	88,760					Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	88,760
Elastic limit per square inch of original section	do...	49,000
Elongation per inch after rupture	inch..	.2133
Elongation per inch under strain at elastic limit	do...	.001700
Reduction in diameter at point of rupture	do...	.154
Reduction in area after rupture, per cent of original section		47.2
Position of rupture		1″.1 from neck
Character of broken surface		silky
Elongation of inch sections		″.13, ″.22, ″.29*

JACKET No. 16.

No. 4786.

Marks, $\frac{10\ B_{11}\ J}{B\ T_4 M}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000667	.000367	.....	.....	
7,500	30,000	.001000	.000333	.....	.....	
8,750	35,000	.001167	.000167	.000033	.000033	
10,000	40,000	.001400	.000233	.....	.....	
10,500	42,000	.001467	.000067	.000067	.000034	
10,750	43,000	.001500	.000033	.....	.....	
11,000	44,000	.001567	.000067	.....	.....	
11,250	45,000	.001600	.000033	.....	.....	
11,500	46,000	.001633	.000033	.....	.....	
11,750	47,000	.001667	.000034	.....	.....	
12,000	48,000	.001700	.000033	.....	.....	
12,250	49,000	.001733	.000033	.....	.....	
12,500	50,000	.001800	.000067	.....	.....	Elastic limit.
12,750	51,000	.004167	.002367	.....	.....	
13,000	52,000	.006500	.002333	.....	.....	
13,250	53,000	.007067	.000567	.....	.....	
13,500	54,000	.008000	.000933	.....	.....	
13,750	55,000	.008833	.000833	.....	.....	
23,260	93,040	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	93,040
Elastic limit per square inch of original section	do...	50,000
Elongation per inch after rupture	inch..	.2267
Elongation per inch under strain at elastic limit	do...	.001800
Reduction in diameter at point of rupture	do...	.154
Reduction in area after rupture, per cent of original section		47.2
Position of rupture		1″.8 from neck
Character of broken surface		silky
Elongation of inch sections		″.14, ″.38*, ″.16

No. 4785.

Marks, $\frac{10\ R_{10}\ J}{M\ T_2\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000967	.000334	.....	.....	
8,750	35,000	.001167	.000200	0.	.....	
10,000	40,000	.001333	.000166	.....	.....	
10,500	42,000	.001400	.000067	0.	.....	
10,750	43,000	.001433	.000033	.....	.....	
11,000	44,000	.001467	.000034	.....	.....	
11,250	45,000	.001500	.000033	.....	.....	
11,500	46,000	.001533	.000033	.....	.....	
11,750	47,000	.001567	.000034	.....	.....	
12,000	48,000	.001633	.000066	.....	.....	
12,250	49,000	.001667	.000034	.....	.....	Elastic limit.
12,500	50,000	.001833	.000166	.....	.....	
12,750	51,000	.002167	.000334	.....	.....	
13,000	52,000	.003733	.001566	.....	.....	
13,250	53,000	.004833	.001100	.....	.....	
13,500	54,000	.006500	.001667	.....	.....	
22,850	91,400	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,400
Elastic limit per square inch of original section	do...	49,000
Elongation per inch after rupture	inch..	.1967
Elongation per inch under strain at elastic limit	do...	.001667
Reduction in diameter at point of rupture	do...	.134
Reduction in area after rupture, per cent of original section		41.9
Position of rupture		1″.8 from neck
Character of broken surface		silky
Elongation of inch sections		″.11, ″.33*, ″.15

JACKET No. 21.

No. 4832.

Marks, $\frac{10\ R_n\ J}{B\ T_s\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000967	.000334	.....	.....	
8,750	35,000	.001133	.000166	0.	.....	
10,000	40,000	.001300	.000167	.....	.....	
10,500	42,000	.001367	.000067	0.	.....	
10,750	43,000	.001400	.000033	.....	.....	
11,000	44,000	.001433	.000033	.....	.....	
11,250	45,000	.001467	.000034	.....	.....	
11,500	46,000	.001500	.000033	.....	.....	
11,750	47,000	.001567	.000067	.....	.....	
12,000	48,000	.001600	.000033	.....	.....	
12,250	49,000	.001633	.000033	.....	.....	
12,500	50,000	.001667	.000034	.....	.....	
12,750	51,000	.001700	.000033	.....	.....	
13,000	52,000	.001733	.000033	.....	.....	Elastic limit.
13,250	53,000	.003167	.001434	.....	.....	
13,500	54,000	.004333	.001166	.....	.....	
13,750	55,000	.005500	.001167	.....	.....	
14,000	56,000	.006500	.001000	.....	.....	
14,250	57,000	.007333	.000833	.....	.....	
24,310	97,240	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	97,240
Elastic limit per square inch of original section	do...	52,000
Elongation per inch after rupture	inch..	.2200
Elongation per inch under strain at elastic limit	do...	.001733
Reduction in diameter at point of rupture	do...	.144
Reduction in area after rupture, per cent of original section		44.6
Position of rupture		1″.6 from neck
Character of broken surface		silky, trace of granulation
Elongation of inch sections		″.18, ″.34*, ″.14

No. 4831.

Marks, $\frac{10\ R_2{}^1 J}{M\ T_2{}^1 M}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000333	.000233	.....	.....	
5,000	20,000	.000667	.000334	.....	.....	
7,500	30,000	.001000	.000333	.....	.....	
8,750	35,000	.001167	.000167	0.	.....	
10,000	40,000	.001333	.000166	.....	.....	
10,500	42,000	.001400	.000067	0.	.....	
10,750	43,000	.001433	.000033	.....	.....	
11,000	44,000	.001467	.000034	.....	.....	
10,250	45,000	.001500	.000033	.....	.....	
11,500	46,000	.001567	.000067	.....	.....	
11,750	47,000	.001633	.000066	.....	.....	
12,000	48,000	.001667	.000034	.....	.....	
12,250	49,000	.001700	.000033	.....	.....	
12,500	50,000	.001733	.000033	.....	.....	
12,750	51,000	.001767	.000034	.....	.....	
13,000	52,000	.001800	.000033	.....	.....	
13,250	53,000	.001867	.000067	.....	.....	Elastic limit.
13,500	54,000	.002833	.000966	.....	.....	
13,750	55,000	.006500	.003667	.....	.....	
14,000	56,000	.007667	.001167	.....	.....	
14,250	57,000	.009000	.001333	.....	.....	
14,500	58,000	.009733	.000733	.....	.....	
23,180	92,720	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	92,720
Elastic limit per square inch of original section	do...	53,000
Elongation per inch after rupture	inch..	.2433
Elongation per inch under strain at elastic limit	do...	.001867
Reduction in diameter at point of rupture	do...	.164
Reduction in area after rupture, per cent of original section		49.7
Position of rupture		1″.28 from neck
Character of broken surface		silky
Elongation of inch sections		″.26*, ″.28*, ″.17

JACKET No. 23.

No. 4836.

Marks, $\frac{10\ B_{m}\ J}{B\ T_{1}\ M}$

Diameter, ″.564.

Sectional area, .25 square inch.

Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000967	.000334	.....	.....	
8,750	35,000	.001133	.000166	0.	.....	
10,000	40,000	.001300	.000167	.....	.....	
10,500	42,000	.001367	.000067	0.	.....	
10,750	43,000	.001400	.000033	.....	.....	
11,000	44,000	.001433	.000033	.....	.....	
11,250	45,000	.001500	.000067	.....	.....	
11,500	46,000	.001567	.000067	.....	.....	
11,750	47,000	.001600	.000033	.....	.....	
12,000	48,000	.001633	.000033	.....	.....	
12,250	49,000	.001667	.000034	.....	.....	Elastic limit.
12,500	50,000	.004000	.002333	.....	.....	
12,750	51,000	.005167	.001167	.....	.....	
13,000	52,000	.006000	.000833	.....	.....	
13,250	53,000	.007000	.001000	.....	.....	
13,500	54,000	.007667	.000667	.....	.....	
23,680	94,720	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	94,720
Elastic limit per square inch of original section	do....	49,000
Elongation per inch after rupture	inch..	.2000
Elongation per inch under strain at elastic limit	do....	.001667
Reduction in diameter at point of rupture	do....	.104
Reduction in area after rupture, per cent of original section		33.5
Position of rupture		1″.7 from neck
Character of broken surface		silky, 50 per cent; granular, 50 per cent in irregular sections; opened cracks in vicinity of place of rupture.
Elongation of inch sections		″.14, ″.31, ″.15

No. 4835.

Marks, $\frac{10\,R_{ss}\,J}{M\,T_3\,M}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000967	.000334	.....	.....	
8,750	35,000	.001100	.000133	0.	.....	
10,000	40,000	.001267	.000167	.....	.....	
10,500	42,000	.001333	.000066	0.	.....	
10,750	43,000	.001367	.000034	.....	.....	
11,000	44,000	.001400	.000033	.....	.....	
11,250	45,000	.001433	.000033	.....	.....	
11,500	46,000	.001467	.000034	.....	.....	
11,750	47,000	.001500	.000033	.....	.....	
12,000	48,000	.001567	.000067	.....	.....	
12,250	49,000	.001600	.000033	.....	.....	
12,500	50,000	.001633	.000033	.....	.....	
12,750	51,000	.001667	.000034	.....	.....	
13,000	52,000	.001700	.000033	.....	.....	Elastic limit.
13,250	53,000	.004833	.003133	.....	.....	
13,500	54,000	.006333	.001500	.....	.....	
13,750	55,000	.007333	.001000	.....	.....	
14,000	56,000	.008500	.001167	.....	.....	
14,250	57,000	.009333	.000833	.....	.....	
22,540	90,160	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	90,160
Elastic limit per square inch of original section	do...	52,000
Elongation per inch after rupture	inch..	.2067
Elongation per inch under strain at elastic limit	do...	.001700
Reduction in diameter at point of rupture	do...	.164
Reduction in area after rupture, per cent of original section		49.7
Position of rupture		1″.04 from neck
Character of broken surface		silky
Elongation of inch sections		″.15, ″.35*, ″.12

JACKET No. 33.

No. 4910.

Marks, $\frac{10\ R_2 J}{B\ T_2 M}$
Diameter, ″.564.
Sectional area .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000333	.000233	.....	.....	
5,000	20,000	.000667	.000334	.....	.....	
7,500	30,000	.001000	.000333	.....	.....	
8,750	35,000	.001200	.000200	.000083	.000083	
10,000	40,000	.001367	.000167	.....	.....	
10,500	42,000	.001433	.000066	.000083	0.	
10,750	43,000	.001467	.000034	.....	.....	
11,000	44,000	.001500	.000033	.....	.....	
11,250	45,000	.001533	.000033	.....	.....	
11,500	46,000	.001600	.000067	.....	.....	
11,750	47,000	.001633	.000033	.....	.....	
12,000	48,000	.001667	.000034	.....	.....	
12,250	49,000	.001700	.000033	.....	.....	
12,500	50,000	.001733	.000033	.....	.....	Elastic limit.
12,750	51,000	.001833	.000100	.....	.....	
13,000	52,000	.001933	.000100	.....	.....	
13,250	53,000	.002033	.000100	.....	.....	
13,500	54,000	.004333	.002300	.....	.....	
13,750	55,000	.005167	.000834	.....	.....	
23,310	93,240	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	93,240
Elastic limit per square inch of original section	do...	50,000
Elongation per inch after rupture	inch..	.2067
Elongation per inch under strain at elastic limit	do...	.001733
Reduction in diameter at point of rupture	do...	.154
Reduction in area after rupture, per cent of original section		47.2
Position of rupture		1″.10 from neck
Character of broken surface		silky
Elongation of inch sections		″.31*, ″.19, ″.12

No. 4909.

Marks, $\frac{10\ R_{ss}\ J}{M\ T_2\ M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000967	.000334	.....	.....	
8,750	35,000	.001100	.000133	0.	.....	
10,000	40,000	.001267	.000167	.....	.....	
10,500	42,000	.001333	.000066	0.	.....	
10,750	43,000	.001367	.000034	.....	.....	
11,000	44,000	.001400	.000033	.....	.....	
11,250	45,000	.001433	.000033	.....	.....	
11,500	46,000	.001467	.000034	.....	.....	
11,750	47,000	.001500	.000033	.....	.....	
12,000	48,000	.001500	0.	.....	.....	
12,250	49,000	.001533	.000033	.....	.....	
12,500	50,000	.001600	.000067	.....	.....	
12,750	51,000	.001633	.000033	.....	.....	
13,000	52,000	.001700	.000067	.....	.....	Elastic limit.
13,250	53,000	.001967	.000267	.....	.....	
13,500	54,000	.003167	.001200	.....	.....	
13,750	55,000	.004167	.001000	.....	.....	
14,000	56,000	.005333	.001166	.....	.....	
14,250	57,000	.006667	.001334	.....	.....	
23,380	93,520	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	93,520
Elastic limit per square inch of original section	do...	52,000
Elongation per inch after rupture	inch..	.2000
Elongation per inch under strain at elastic limit	do...	.001700
Reduction in diameter at point of rupture	do...	.154
Reduction in area after rupture, per cent of original section		47.2
Position of rupture		1".5 from neck
Character of broken surface		silky
Elongation of inch sections		".13, ".34", ".13

TABULATION OF TENSION SPECIMENS FROM 10-INCH STEEL B. L. RIFLES.

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Contraction of area.	Appearance of fracture.
			Pounds.	*Pounds.*	*P. ct.*	*P. ct.*	
4806	Tube No. 17...	Middle..	50,000	92,040	20.7	41.9	Silky.
4805	.....do.....	....do...	50,000	89,440	24.7	44.6	Do.
4825	Tube No. 21...	....do...	47,000	90,520	20.7	47.2	Do.
4824	.....do.....	....do...	49,000	88,760	21.3	47.2	Do.
4786	Jacket No. 16.	....do...	50,000	93,040	22.7	47.2	Do.
4785	.....do.....	....do...	49,000	91,400	19.7	41.9	Do.
4832	Jacket No. 21.	....do...	52,000	97,240	22.0	44.6	Silky, trace of granulation.
4831	.....do.....	....do...	53,000	92,720	24.3	49.7	Silky.
4836	Jacket No. 23.	....do...	49,000	94,720	20.0	33.5	Silky, 50 per cent; granular, 50 per cent.
4835	.....do.....	....do...	52,000	90,160	20.7	49.7	Silky.
4910	Jacket No. 33.	....do...	50,000	93,240	20.7	47.2	Do.
4909	.....do.....	....do...	52,000	93,520	20.0	47.2	Do.

12-INCH STEEL B. L. RIFLES

SPECIMENS FROM TUBES AND JACKETS.

TUBE No. 10.

No. 4788.

Marks, $\frac{12\,B_{12}\,T}{B\,T_4\,M}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000300	.000167	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000967	.000334	.....	.....	
8,750	35,000	.001167	.000200	0.	.....	
10,000	40,000	.001367	.000200	0.	.....	
10,250	41,000	.001400	.000033	.....	.....	
10,500	42,000	.001433	.000033	.....	.....	
10,750	43,000	.001500	.000067	.....	.....	
11,000	44,000	.001533	.000033	.....	.....	
11,250	45,000	.001567	.000034	.....	.....	
11,500	46,000	.001600	.000033	.....	.....	
11,750	47,000	.001667	.000067	.....	.....	Elastic limit.
12,000	48,000	.001900	.000233	.....	.....	
12,250	49,000	.002067	.000167	.....	.....	
12,500	50,000	.002333	.000266	.....	.....	
12,750	51,000	.002767	.000434	.....	.....	
13,000	52,000	.004000	.001233	.....	.....	
24,080	96,320	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	96,320
Elastic limit per square inch of original section	do...	47,000
Elongation per inch after rupture	inch..	.1933
Elongation per inch under strain at elastic limit	do...	.001667
Reduction in diameter at point of rupture	do...	.114
Reduction in area after rupture, per cent of original section		36.4
Position of rupture		1″.1 from neck
Character of broken surface		granular, 60 per cent; silky, 40 per cent
Elongation of inch sections		″.12, ″.19, ″.27*

No. 4787.

Marks, $\frac{12\ R_{10}\ T}{M\ T_2\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000967	.000334	.....	.....	
8,750	35,000	.001133	.000166	0.	.....	
10,000	40,000	.001300	.000167	.000033	.000033	
10,250	41,000	.001333	.000033	.....	.....	
10,500	42,000	.001367	.000034	.....	.....	
10,750	43,000	.001400	.000033	.....	.....	
11,000	44,000	.001433	.000033	.....	.....	
11,250	45,000	.001500	.000067	.....	.....	
11,500	46,000	.001533	.000033	.....	.....	
11,750	47,000	.001567	.000034	.....	.....	
12,000	48,000	.001633	.000066	.....	.....	Elastic limit.
12,250	49,000	.002833	.001200	.....	.....	
12,500	50,000	.005000	.002167	.....	.....	
12,750	51,000	.005933	.000933	.....	.....	
13,000	52,000	.006667	.000734	.....	.....	
13,250	53,000	.007333	.000666	.....	.....	
22,940	91,760	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,760
Elastic limit per square inch of original section	do...	48,000
Elongation per inch after rupture	inch..	.2123
Elongation per inch under strain at elastic limit	do...	.001633
Reduction in diameter at point of rupture	do...	.144
Reduction in area after rupture, per cent of original section		44.6
Position of rupture		1″.8 from neck
Character of broken surface		silky
Elongation of inch sections		″.14, ″.37, ″.13

TUBE No. 12.

No. 4914.

Marks, $^{12\,B_{12}\,T}_{B\,T,M}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000967	.000334	.....	.....	
8,750	35,000	.001133	.000166	0.	.....	
10,000	40,000	.001300	.000167	0.	.....	
10,250	41,000	.001333	.000033	.....	.....	
10,500	42,000	.001367	.000034	.....	.....	
10,750	43,000	.001400	.000033	.....	.....	
11,000	44,000	.001433	.000033	.....	.....	Elastic limit.
11,250	45,000	.001633	.000200	.....	.....	
11,500	46,000	.001867	.000234	.....	.....	
11,750	47,000	.002167	.000300	.....	.....	
12,000	48,000	.002667	.000500	.....	.....	
12,250	49,000	.003167	.000500	.....	.....	
22,700	90,800	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	90,800
Elastic limit per square inch of original section	do...	44,000
Elongation per inch after rupture	inch..	.2033
Elongation per inch under strain at elastic limit	do...	.001433
Reduction in diameter at point of rupture	do...	.144
Reduction in area after rupture, per cent of original section		44.6
Position of rupture		1″.35 from neck
Character of broken surface		dull silky, with trace of granulation
Elongation of inch sections		″.27, ″.35*, ″.11

No. 4913.

Marks, $\frac{12\ R_{12}\ T}{M\ T_2\ M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000967	.000334	.....	.....	
8,750	35,000	.001100	.000133	0.	.....	
10,000	40,000	.001300	.000200	0.	.....	
10,250	41,000	.001333	.000033	.....	.....	
10,500	42,000	.001367	.000034	.....	.....	
10,750	43,000	.001400	.000033	.....	.....	
11,000	44,000	.001433	.000033	.....	.....	
11,250	45,000	.001467	.000034	.....	.....	
11,500	46,000	.001500	.000033	.....	.....	
11,750	47,000	.001567	.000067	.....	.....	
12,000	48,000	.001633	.000066	.....	.....	
12,250	49,000	.001667	.000034	.....	.....	
12,500	50,000	.001700	.000033	.....	.....	
12,750	51,000	.001733	.000033	.....	.....	Elastic limit.
13,000	52,000	.007500	.005767	.....	.....	
13,250	53,000	.008167	.000667	.....	.....	
13,500	54,000	.009067	.000900	.....	.....	
13,750	55,000	.010000	.000933	.....	.....	
14,000	56,000	.011000	.001000	.....	.....	
22,590	90,360	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	90,360
Elastic limit per square inch of original section	do...	51,000
Elongation per inch after rupture	inch..	.2267
Elongation per inch under strain at elastic limit	do...	.001733
Reduction in diameter at point of rupture	do...	.164
Reduction in area after rupture, per cent of original section		49.7
Position of rupture		1".8 from neck
Character of broken surface		silky
Elongation of inch sections		".13, ".40, ".15

JACKET No. 7.

No. 4752.

Marks, $\begin{matrix} 12\ R_7\ J \\ B\ T_2\ M \end{matrix}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.001000	.000367	.....	.....	
8,750	35,000	.001133	.000133	0.	.....	
10,000	40,000	.001333	.000200	.....	.....	
10,500	42,000	.001367	.000034	0.	.....	
10,750	43,000	.001400	.000033	.....	.....	
11,000	44,000	.001433	.000033	.....	.....	
11,250	45,000	.001467	.000034	.....	.....	
11,500	46,000	.001533	.000066	.....	.....	
11,750	47,000	.001600	.000067	.....	.....	
12,000	48,000	.001633	.000033	.....	.....	
12,250	49,000	.001667	.000034	.....	.....	
12,500	50,000	.001700	.000033	.....	.....	
12,750	51,000	.001733	.000033	.....	.....	Elastic limit.
13,000	52,000	.003000	.001267	.....	.....	
13,250	53,000	.006333	.003333	.....	.....	
13,500	54,000	.007167	.000834	.....	.....	
13,750	55,000	.008000	.000833	.....	.....	
14,000	56,000	.008667	.000667	.....	.....	
23,010	92,040	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	92,04
Elastic limit per square inch of original section	do...	51,00
Elongation per inch after rupture	inch..	.220
Elongation per inch under strain at elastic limit	do...	.00173
Reduction in diameter at point of rupture	do...	.144
Reduction in area after rupture, per cent of original section		44.
Position of rupture		1″.48 from neck
Character of broken surface		silky, trace of granulation
Elongation of inch sections		″.19, ″.33*, ″.1

No. 4751.

Marks, $\frac{12\ R,\ J}{M\ T,\ M}$
Diameter, $''.564$.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000800	.000200	.....	.....	
5,000	20,000	.000667	.000367	.....	.....	
7,500	30,000	.001000	.000333	.....	.....	
8,750	35,000	.001200	.000200	0.	.....	
10,000	40,000	.001367	.000167	.....	.....	
10,500	42,000	.001400	.000033	0.	.....	
10,750	43,000	.001433	.000033	.....	.....	
11,000	44,000	.001467	.000034	.....	.....	
11,250	45,000	.001500	.000033	.....	.....	
11,500	46,000	.001567	.000067	.....	.....	
11,750	47,000	.001600	.000033	.....	.....	
12,000	48,000	.001633	.000033	.....	.....	
12,250	49,000	.001667	.000034	.....	.....	
12,500	50,000	.001700	.000033	.....	.....	
12,750	51,000	.001733	.000033	.....	.....	
13,000	52,000	.001767	.000034	.....	.....	
13,250	53,000	.001800	.000033	.....	.....	Elastic limit.
13,500	54,000	.004333	.002533	.....	.....	
13,750	55,000	.006333	.002000	.....	.....	
14,000	56,000	.007833	.001000	.....	.....	
14,250	57,000	.008333	.001000	.....	.....	
14,500	58,000	.009733	.001400	.....	.....	
22,960	91,840	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,840
Elastic limit per square inch of original section	do...	53,000
Elongation per inch after rupture	inch..	.200
Elongation per inch under strain at elastic limit	do...	.001800
Reduction in diameter at point of rupture	do...	.164
Reduction in area after rupture, per cent of original section		49.7
Position of rupture		1″.14 from neck
Character of broken surface		silky
Elongation of inch sections		″.20, ″.19, ″.12

JACKET No. 10.

No. 4834.

Marks, $\frac{12\ B\ T,\ M}{R_{10}\ J}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000967	.000334	.....	.....	
8,750	35,000	.001133	.000166	0.	.....	
10,000	40,000	.001300	.000167	.....	.....	
10,500	42,000	.001367	.000067	0.	.....	
10,750	43,000	.001400	.000033	.....	.....	
11,000	44,000	.001433	.000033	.....	.....	
11,250	45,000	.001467	.000034	.....	.....	
11,500	46,000	.001500	.000033	.....	.....	
11,750	47,000	.001533	.000033	.....	.....	
12,000	48,000	.001600	.000067	.....	.....	
12,250	49,000	.001633	.000033	.....	.....	
12,500	50,000	.001667	.000034	.....	.....	Elastic limit.
12,750	51,000	.002667	.001000	.....	.....	
13,000	52,000	.011333	.008666	.....	.....	
13,250	53,000	.012000	.000667	.....	.....	
13,500	54,000	.012667	.000667	.....	.....	
13,750	55,000	.013400	.000733	.....	.....	
22,790	91,160	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,160
Elastic limit per square inch of original section	do...	50,000
Elongation per inch after rupture	inch..	.2233
Elongation per inch under strain at elastic limit	do..	.001667
Reduction in diameter at point of rupture	do..	.074
Reduction in area after rupture, per cent of original section		24.6
Position of rupture		1" from neck
Character of broken surface		granular 60 per cent, oblique 40 per cent. Opened minute cracks in surface of the stem.
Elongation of inch sections		".24*, ".25*, ".18

No. 4833.

Marks, $\frac{12\ R_{12}\ J}{M\ T_2\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.001000	.000367	.....	.....	
8,750	35,000	.001167	.000167	0.	.....	
10,000	40,000	.001333	.000166	.....	.....	
10,500	42,000	.001400	.000067	0.	.....	
10,750	43,000	.001433	.000033	.....	.....	
11,000	44,000	.001467	.000034	.....	.....	
11,250	45,000	.001500	.000033	.....	.....	
11,500	46,000	.001533	.000033	.....	.....	
11,750	47,000	.001567	.000034	.....	.....	
12,000	48,000	.001600	.000033	.....	.....	
12,250	49,000	.001633	.000033	.....	.....	
12,500	50,000	.001667	.000034	.....	.....	Elastic limit.
12,750	51,000	.001900	.000233	.....	.....	
13,000	52,000	.003000	.001100	.....	.....	
13,250	53,000	.004833	.001833	.....	.....	
13,500	54,000	.007000	.002167	.....	.....	
13,750	55,000	.007667	.000667	.....	.....	
24,180	96,720	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	96,720
Elastic limit per square inch of original section	do...	50,000
Elongation per inch after rupture	inch..	.1767
Elongation per inch under strain at elastic limit	do...	.001667
Reduction in diameter at point of rupture	do...	.064
Reduction in area after rupture, per cent of original section		27.6
Position of rupture		″.7 from neck
Character of broken surface		granular; silky spot at the circumference
Elongation of inch sections		″.11, ″.16, ″.26*

JACKET No. 13.

No. 4904.

Marks, $\frac{12\ B_{13}\ J}{B\ T,\ M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000333	.000233	.....	.....	
5,000	20,000	.000667	.000334	.....	.....	
7,500	30,000	.001000	.000333	.....	.....	
8,750	35,000	.001200	.000200	0.	.....	
10,000	40,000	.001367	.000167	.....	.....	
10,500	42,000	.001400	.000033	0.	.....	Elastic limit.
10,750	43,000	.001600	.000200	.....	.....	
11,000	44,000	.002333	.000733	.....	.....	
11,250	45,000	.002733	.000400	.....	.....	
11,500	46,000	.003333	.000600	.....	.....	
11,750	47,000	.003733	.000400	.....	.....	
12,000	48,000	.004500	.000767	.....	.....	
23,340	93,360	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	93,360
Elastic limit per square inch of original section	do...	42,000
Elongation per inch after rupture	inch..	.1967
Elongation per inch under strain at elastic limit	do...	.001400
Reduction in diameter at point of rupture	do...	.124
Reduction in area after rupture, per cent of original section		39.2
Position of rupture		1" from neck
Character of broken surface		dull silky
Elongation of inch sections		".12, ".18, ".29*

No. 4903.

Marks, $\frac{12\ R_{12}\ J}{M\ T_1\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000200	.000200	.....	.....	
5,000	20,000	.000667	.000367	.....	.....	
7,500	30,000	.001000	.000333	.....	.....	
8,750	35,000	.001200	.000200	0.	.....	
10,000	40,000	.001367	.000167	.....	.....	
10,500	42,000	.001400	.000033	.000033	.000033	
10,750	43,000	.001467	.000067	.....	.....	
11,000	44,000	.001533	.000066	.....	.....	
11,250	45,000	.001600	.000067	.....	.....	
11,500	46,000	.001633	.000033	.....	.....	
11,750	47,000	.001667	.000034	.....	.....	Elastic limit.
12,000	48,000	.004600	.002933	.....	.....	
12,250	49,000	.005333	.000733	.....	.....	
12,500	50,000	.006333	.001000	.....	.....	
12,750	51,000	.007333	.001000	.....	.....	
13,000	52,000	.008000	.000667	.....	.....	
22,840	91,360	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,360
Elastic limit per square inch of original section	do...	47,000
Elongation per inch after rupture	inch..	.2000
Elongation per inch under strain at elastic limit	do...	.001667
Reduction in diameter at point of rupture	do...	.124
Reduction in area after rupture, per cent of original section		39.2
Position of rupture		1″.3 from neck.
Character of broken surface		silky, 80 per cent of surface interspersed with fine granulation
Elongation of inch sections		″.11, ″.30, ″.19

TABULATION OF TENSION SPECIMENS FROM 12-INCH STEEL B. L. RIFLES.

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Contraction of area.	Appearance of fracture.
			Pounds.	*Pounds.*	*P. ct.*	*P. ct.*	
4788	Tube No. 10...	Middle..	47,000	96,320	19.3	36.4	Granular, 60 per cent; silky, 40 per cent.
4787	.....do.....	....do ...	48,000	91,760	21.3	44.6	Silky.
4914	Tube No. 12...	....do ...	44,000	90,800	20.3	44.6	Dull silky, trace of granulation.
4913	.....do.....	....do ...	51,000	90,360	22.7	49.7	Silky.
4752	Jacket No. 7..	....do ...	51,000	92,040	22.0	44.6	Silky, trace of granulation.
4751	.....do.....	....do ...	53,000	91,840	20.0	49.7	Silky.
4834	Jacket No. 10.	....do ...	50,000	91,160	22.3	24.6	Granular, 60 per cent; silky oblique, 40 per cent.
4833	.....do.....	....do ...	50,000	96,720	17.7	27.6	Granular, silky spot.
4904	Jacket No. 13.	....do ...	42,000	93,360	19.7	39.2	Dull silky.
4903	.....do.....	....do ...	47,000	91,360	20.0	39.2	Silky and fine granular.

12-INCH STEEL B. L. MORTARS.

SPECIMENS FROM TUBES AND JACKETS.

TUBE No. 2.

No. 4838.

Marks, $\frac{12\,M,\,T}{B\,T,\,M}$
Diameter, $''.565$.
Sectional area, .25 square inch.
Gauged length, $3''$.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000967	.000334	.....	.....	
8,750	35,000	.001133	.000166	0.	.....	
10,000	40,000	.001333	.000200	0.	.....	
10,250	41,000	.001367	.000034	.....	.....	
10,500	42,000	.001400	.000033	.....	.....	
10,750	43,000	.001433	.000033	.....	.....	
11,000	44,000	.001467	.000034	.....	.....	
11,250	45,000	.001500	.000033	.....	.....	
11,500	46,000	.001533	.000033	.....	.....	
11,750	47,000	.001567	.000034	.....	.....	
12,000	48,000	.001633	.000066	.....	.....	
12,250	49,000	.001667	.000034	.....	.....	
12,500	50,000	.001733	.000066	.....	.....	Elastic limit.
12,750	51,000	.002333	.000600	.....	.....	
13,000	52,000	.003833	.000500	.....	.....	
13,250	53,000	.005167	.001334	.....	.....	
13,500	54,000	.006167	.001000	.....	.....	
13,750	55,000	.007000	.000833	.....	.....	
23,140	92,560	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	92,560
Elastic limit per square inch of original section	do...	50,000
Elongation per inch after rupture	inch..	.2333
Elongation per inch under strain at elastic limit	do...	.001733
Reduction in diameter at point of rupture	do...	.155
Reduction in area after rupture, per cent of original section		47.2
Position of rupture		".70 from neck
Character of broken surface		silky
Elongation of inch sections		".17, ".17, ".36

No. 4337.

Marks, $\frac{12\,M_2\,T}{M\,T_2\,M}$
Diameter, ″.562.
Sectional area, .248 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
248	1,000	0.	0.	0.	0.	Initial load.
1,240	5,000	.000100	.000100	0.	.....	
2,480	10,000	.000333	.000233	.....	.....	
4,960	20,000	.000667	.000334	.....	.....	
7,440	30,000	.001000	.000333	.....	.....	
8,680	35,000	.001200	.000200	.000033	.000033	
9,920	40,000	.001367	.000167	.000033	.000033	
10,168	41,000	.001400	.000033	.....	.....	
10,416	42,000	.001433	.000033	.....	.....	
10,664	43,000	.001467	.000034	.....	.....	
10,912	44,000	.001500	.000033	.....	.....	
11,160	45,000	.001567	.000067	.....	.....	
11,408	46,000	.001633	.000066	.....	.....	
11,656	47,000	.001667	.000034	.....	.....	
11,904	48,000	.001700	.000033	.....	.....	
12,152	49,000	.001733	.000033	.....	.....	
12,400	50,000	.001767	.000034	.....	.....	
12,648	51,000	.001800	.000033	.....	.....	Elastic limit.
12,896	52,000	.002100	.000300	.....	.....	
13,144	53,000	.004667	.002567	.....	.....	
13,392	54,000	.007333	.002666	.....	.....	
13,640	55,000	.008167	.000834	.....	.....	
13,888	56,000	.009000	.000833	.....	.....	
22,590	91,090	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,090
Elastic limit per square inch of original section	do...	51,000
Elongation per inch after rupture	inch..	.2200
Elongation per inch under strain at elastic limit	do...	.001800
Reduction in diameter at point of rupture	do...	.162
Reduction in area after rupture, per cent of original section		49.3
Position of rupture		1″.3 from neck
Character of broken surface		silky
Elongation of inch sections		″.12, ″.34*, ″.19

TUBE No. 7.

No. 4840.

Marks, $\frac{12\,M,T}{B\,T,M}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.001000	.000367	.....	.....	
8,750	35,000	.001133	.000133	0.	.....	
10,000	40,000	.001333	.000200	0.	.....	
10,250	41,000	.001367	.000034	.....	.....	
10,500	42,000	.001400	.000033	.....	.....	
10,750	43,000	.001433	.000033	.....	.....	
11,000	44,000	.001467	.000034	.....	.....	
11,250	45,000	.001500	.000033	.....	.....	
11,500	46,000	.001567	.000067	.....	.....	
11,750	47,000	.001600	.000033	.....	.....	
12,000	48,000	.001667	.000067	.....	.....	
12,250	49,000	.001700	.000033	.....	.....	Elastic limit.
12,500	50,000	.001967	.000267	.....	.....	
12,750	51,000	.004667	.002700	.....	.....	
13,000	52,000	.006000	.001333	.....	.....	
13,250	53,000	.007000	.001000	.....	.....	
13,500	54,000	.008167	.001167	.....	.....	
22,240	88,960	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	88,960
Elastic limit per square inch of original section	do...	49,000
Elongation per inch after rupture	inch..	.2267
Elongation per inch under strain at elastic limit	do....	.001700
Reduction in diameter at point of rupture	do....	.144
Reduction in area after rupture, per cent of original section		44.6
Position of rupture		1".0 from neck
Character of broken surface		silky
Elongation of inch sections		".15, ".89*, ".14

No. 4839.

Marks, $\frac{12\,M,\,T}{M\,T,\,M}$
Diameter, ″.563.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000967	.000334	.....	.....	
8,750	35,000	.001133	.000166	0.	.....	
10,000	40,000	.001333	.000200	0.	.....	
10,250	41,000	.001367	.000034	.....	.....	
10,500	42,000	.001400	.000033	.....	.....	
10,750	43,000	.001433	.000033	.....	.....	
11,000	44,000	.001467	.000034	.....	.....	
11,250	45,000	.001500	.000033	.....	.....	
11,500	46,000	.001533	.000033	.....	.....	
11,750	47,000	.001567	.000034	.....	.....	
12,000	48,000	.001633	.000066	.....	.....	
12,250	49,000	.001667	.000034	.....	.....	
12,500	50,000	.001700	.000033	.....	.....	
12,750	51,000	.001733	.000033	.....	.....	Elastic limit.
13,000	52,000	.006667	.004934	.....	.....	
13,250	53,000	.008000	.001333	.....	.....	
13,500	54,000	.009333	.001333	.....	.....	
13,750	55,000	.010333	.001000	.....	.....	
14,000	56,000	.011167	.000834	.....	.....	
22,010	88,040	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	88,040
Elastic limit per square inch of original section	do...	51,000
Elongation per inch after rupture	inch..	.2133
Elongation per inch under strain at elastic limit	do...	.001733
Reduction in diameter at point of rupture	do...	.143
Reduction in area after rupture, per cent of original section		44.6
Position of rupture		1″.4 from neck
Character of broken surface		silky
Elongation of inch sections		″.14, ″.19, ″.31*

JACKET No. 2.

No. 4912.

Marks, $^{12\,M,J}_{B\,T,M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000967	.000334	.....	.....	
8,750	35,000	.001100	.000133	0.	.....	
10,000	40,000	.001300	.000200	.....	.....	
10,500	42,000	.001367	.000067	0.	.....	
10,750	43,000	.001400	.000033	.....	.....	
11,000	44,000	.001467	.000067	.....	.....	
11,250	45,000	.001533	.000066	.....	.....	Elastic limit.
11,500	46,000	.002167	.000634	.....	.....	
11,750	47,000	.003667	.001500	.....	.....	
12,000	48,000	.004333	.000666	.....	.....	
12,250	49,000	.005133	.000800	.....	.....	
12,500	50,000	.006000	.000867	.....	.....	
22,110	88,440	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	88,440
Elastic limit per square inch of original section	do...	45,000
Elongation per inch after rupture	inch..	.2133
Elongation per inch under strain at elastic limit	do...	.001533
Reduction in diameter at point of rupture	do...	.154
Reduction in area after rupture, per cent of origiual section		47.2
Position of rupture		1".2 from neck
Character of broken surface		silky
Elongation of inch sections		".12, ".23, ".29*

No. 4911.

Marks, $\frac{12\,M_2\,J}{M\;T_5\;M}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000333	.000233	.....	.....	
5,000	20,000	.000667	.000334	.....	.....	
7,500	30,000	.001000	.000333	.....	.....	
8,750	35,000	.001167	.000167	0.	.....	
10,000	40,000	.001333	.000166	.....	.....	
10,500	42,000	.001400	.000067	.000033	.000033	
10,750	43,000	.001433	.000033	.....	.....	
11,000	44,000	.001467	.000034	.....	.....	
11,250	45,000	.001533	.000066	.....	.....	
11,500	46,000	.001567	.000034	.....	.....	
11,750	47,000	.001633	.000066	.....	.....	
12,000	48,000	.001667	.000034	.....	.....	Elastic limit.
12,250	49,000	.001833	.000166	.....	.....	
12,500	50,000	.002933	.001100	.....	.....	
12,750	51,000	.004000	.001067	.....	.....	
13,000	52,000	.005333	.001333	.....	.....	
13,250	53,000	.006167	.001834	.....	.....	
22,540	90,160	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	90,160
Elastic limit per square inch of original section	do...	48,000
Elongation per inch after rupture	inch..	.2000
Elongation per inch under strain at elastic limit	do...	.001667
Reduction in diameter at point of rupture	do...	.144
Reduction in area after rupture, per cent of original section		44.6
Position of rupture		1″.3 from neck
Character of broken surface		silky
Elongation of inch sections		″.13, ″.27*, ″.20

JACKET No. 5.

No. 4896.

Marks, $\frac{12\ M_s\ J}{B\ T, M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000300	.000167	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.001000	.000367	.....	.....	
8,750	35,000	.001200	.000200	.....	.....	
10,000	40,000	.001400	.000200	.....	.....	
10,500	42,000	.001467	.000067	.000033	.000033	
10,750	43,000	.001533	.000066	.....	.....	
11,000	44,000	.001600	.000067	.....	.....	
11,250	45,000	.001633	.000033	.....	.....	
11,500	46,000	.001667	.000034	.....	.....	
11,750	47,000	.001733	.000066	.....	.....	Elastic limit.
12,000	48,000	.005333	.003600	.....	.....	
12,250	49,000	.006333	.001000	.....	.....	
12,500	50,000	.007333	.001000	.....	.....	•
12,750	51,000	.008333	.001000	.....	.....	
13,000	52,000	.009333	.001000	.....	.....	
21,660	86,640	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	86,640
Elastic limit per square inch of original section	do...	47,000
Elongation per inch after rupture	inch..	.2200
Elongation per inch under strain at elastic limit	do...	.001733
Reduction in diameter at point of rupture	do...	.164
Reduction in area after rupture, per cent of original section		49.7
Position of rupture		1".6 from neck
Character of broken surface		silky oblique
Elongation of inch sections		".13, ".37*, ".16

No. 4895.

Marks, $\frac{12\,M_s\,J}{M\,T_2\,M}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000267	.000167	.....	.....	
5,000	20,000	.000600	.000333	.....	.....	
7,500	30,000	.000967	.000367	.....	.....	
8,750	35,000	.001133	.000166	0.	.....	
10,000	40,000	.001300	.000167	.....	.....	
10,500	42,000	.001333	.000033	0.	.....	
10,750	43,000	.001367	.000034	.....	.....	
11,000	44,000	.001400	.000033	.....	.....	
11,250	45,000	.001433	.000033	.....	.....	
11,500	46,000	.001467	.000034	.....	.....	
11,750	47,000	.001500	.000033	.....	.....	Elastic limit.
12,000	48,000	.001633	.000133	.....	.....	
12,250	49,000	.003000	.001367	.....	.....	
12,500	50,000	.005500	.002500	.....	.....	
12,750	51,000	.006100	.000600	.....	.....	
13,000	52,000	.007333	.001233	.....	.....	
22,300	89,200	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	89,300
Elastic limit per square inch of original section	do...	47,000
Elongation per inch after rupture	inch..	.1967
Elongation per inch under strain at elastic limit	do...	.001500
Reduction in diameter at point of rupture	do...	.164
Reduction in area after rupture, per cent of original section		49.7
Position of rupture		1″.1 from neck
Character of broken surface		silky
Elongation of inch sections		″.30, ″.18, ″.11

JACKET No. 8.

No. 4898.

Marks, $\frac{12\,M_2\,J}{B\,T_2\,M}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000967	.000334	.....	.....	
8,750	35,000	.001133	.000166	0.	.....	
10,000	40,000	.001300	.000167	.....	.....	
10,500	42,000	.001367	.000067	0.	.....	
10,750	43,000	.001400	.000033	.....	.....	
11,000	44,000	.001433	.000033	.....	.....	
11,250	45,000	.001467	.000034	.....	.....	
11,500	46,000	.001500	.000033	.....	.....	
11,750	47,000	.001567	.000067	.....	.....	
12,000	48,000	.001633	.000066	.....	.....	
12,250	49,000	.001667	.000034	.....	.....	
12,500	50,000	.001733	.000066	.....	.....	Elastic limit.
12,750	51,000	.003300	.001567	.....	.....	
13,000	52,000	.005000	.001700	.....	.....	
13,250	53,000	.006333	.001333	.....	.....	
13,500	54,000	.007500	.001167	.....	.....	
13,750	55,000	.008333	.000833	.....	.....	
23,300	93,200	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	93,200
Elastic limit per square inch of original section	do...	50,000
Elongation per inch after rupture	inch..	.2033
Elongation per inch under strain at elastic limit	do...	.001733
Reduction in diameter at point of rupture	do...	.154
Reduction in area after rupture, per cent of original section		47.2
Position of rupture		″9. from neck
Character of broken surface		silky
Elongations of inch sections		″.31*, ″.16, ″.14

No. 4897.

Marks, $\frac{12\ M.}{M\ T.}\ \frac{J.}{M.}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000333	.000200	.....	.....	
5,000	20,000	.000667	.000334	.....	.....	
7,500	30,000	.001033	.000366	.....	.....	
8,750	35,000	.001200	.000167	.000033	.000033	
10,000	40,000	.001367	.000167	.....	.....	
10,500	42,000	.001400	.000033	.000033	0.	
10,750	43,000	.001467	.000067	.....	.....	
11,000	44,000	.001533	.000066	.....	.....	
11,250	45,000	.001567	.000034	.....	.....	
11,500	46,000	.001600	.000033	.....	.....	
11,750	47,000	.001633	.000033	.....	.....	
12,000	48,000	.001667	.000034	.....	.....	
12,250	49,000	.001700	.000033	.....	.....	
12,500	50,000	.001733	.000033	.....	.....	
12,750	51,000	.001800	.000067	.....	.....	Elastic limit.
13,000	52,000	.005000	.003200	.....	.....	
13,250	53,000	.006333	.001333	.....	.....	
13,500	54,000	.007333	.001000	.....	.....	
13,750	55,000	.008333	.001000	.....	.....	
14,000	56,000	.009333	.001000	.....	.....	
23,110	92,440	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	92,440
Elastic limit per square inch of original section	do...	51,000
Elongation per inch after rupture	inch..	.1800
Elongation per inch under strain at elastic limit	do...	.001800
Reduction in diameter at point of rupture	do...	.104
Reduction in area after rupture, per cent of original section		33.5
Position of rupture		1".5 from neck
Character of broken surface		silky, serrated, 60 per cent; granular, 40 per cent. Opened cracks in stem in vicinity of place of rupture.
Elongation of inch sections		".12, ".29*, ".13

TABULATION OF TENSION SPECIMENS FROM 12-INCH STEEL B. L. MORTARS.

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Contraction of area.	Appearance of fracture.
			Pounds.	*Pounds.*	*P. ct.*	*P. ct.*	
4838	Tube No. 2....	Middle..	50,000	92,560	23.3	47.2	Silky.
4837	.....do	....do ...	51,000	91,090	22.0	49.3	Do.
4840	Tube No. 7....	....do ...	49,000	88,960	22.7	44.6	Do.
4839	.....do	....do ...	51,000	88,040	21.3	44.6	Do.
4912	Jacket No. 2 ..	....do ...	45,000	88,440	21.3	47.2	Do.
4911	.....do	....do ...	48,000	90,160	20.0	44.6	Do.
4896	Jacket No. 5 ..	....do ...	47,000	86,640	22.0	49.7	Silky, oblique.
4895	.....do	....do ...	47,000	89,200	19.7	49.7	Silky.
4898	Jacket No. 8 ..	....do ...	50,000	93,000	20.3	47.2	Do.
4897	.....do	....do ...	51,000	92,440	18.0	33.5	Silky, serrated, 60 per cent; granular, 40 per cent.

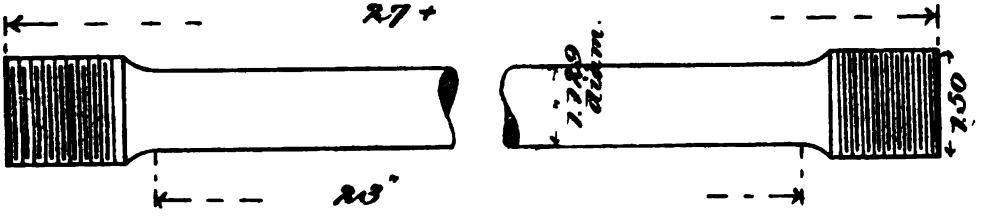
12-INCH B. L. RIFLED MORTARS.

SPECIMENS FROM CAST-IRON BODIES.

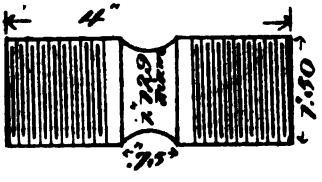
12-inch B.L. Rifled Mortars

Forms of specimens

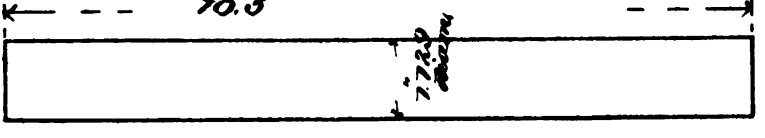
Tension



Tenacity



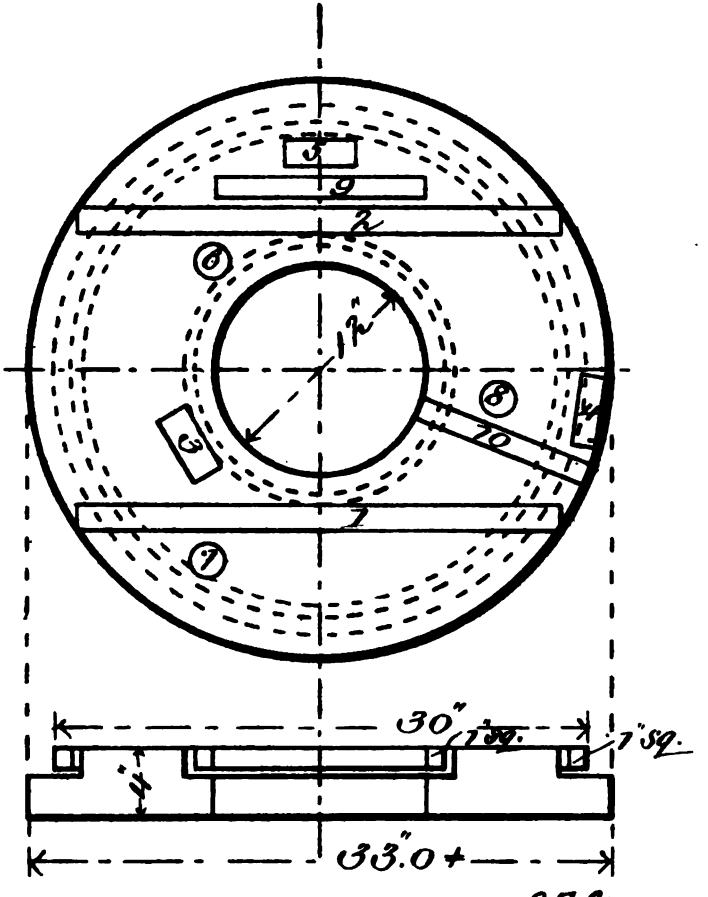
Compression



12-inch B.L. Rifled Mortars

Cast iron Bodies

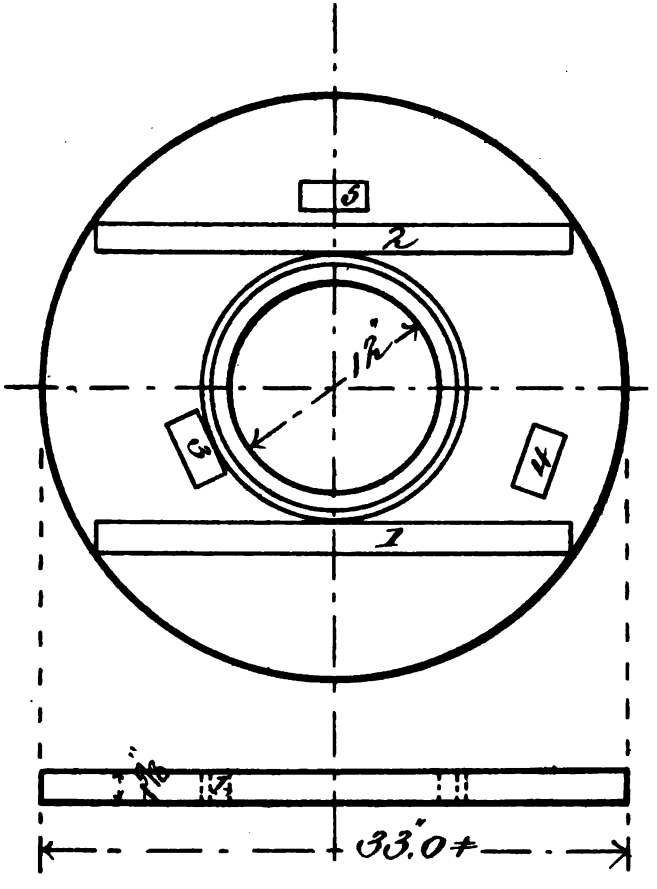
Breech end



12-inch B. L. Rifled Mortars

Cast iron Bodies

Muzzle end



No. 4790.

Marks, $^{12\ M\ R_{21}\ T\ R_2}_{B\ T_{21}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000105	.000055	.....	.....	
4,000	4,000	.000160	.000055	.....	.....	
5,000	5,000	.000215	.000055	0.	.....	
6,000	6,000	.000280	.000065	.....	.....	
7,000	7,000	.000340	.000060	.....	.....	
8,000	8,000	.000400	.000060	.....	.....	
9,000	9,000	.000455	.000055	.....	.....	
10,000	10,000	.000520	.000065	.000025	.000025	
11,000	11,000	.000590	.000070	.....	.....	
12,000	12,000	.000655	.000065	.000055	.000030	
13,000	13,000	.000740	.000085	.....	.....	
14,000	14,000	.000815	.000075	.000090	.000045	
15,000	15,000	.000905	.000090	.....	.....	
16,000	16,000	.001000	.000095	.000125	.000035	
17,000	17,000	.001105	.000105	.....	.....	
18,000	18,000	.001235	.000130	.000210	.000085	
19,000	19,000	.001315	.000080	.....	.....	
20,000	20,000	.001430	.000115	.000295	.000085	
21,000	21,000	.001610	.000180	.....	.....	
22,000	22,000	.001855	.000245	.000540	.000245	
23,000	23,000	.002150	.000295	.....	.....	
24,000	24,000	.002500	.000350	.001025	.000485	
25,000	25,000	.003000	.000500	.001410	.000385	
25,430	25,430	.....	.....	.....	.....	Tensile strength.

Fractured 7″.5 from neck. Appearance granular.

No. 4791.

Marks, $^{12}\,\mathrm{M}\,\mathrm{R}_1\,\mathrm{T}\,\mathrm{R}_1$ / $\mathrm{M}\,\mathrm{T}_1$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000200	.000050	0.	.....	
6,000	6,000	.000250	.000050	.....	.....	
7,000	7,000	.000300	.000050	.....	.....	
8,000	8,000	.000350	.000050	.....	.....	
9,000	9,000	.000405	.000055	.....	.....	
10,000	10,000	.000455	.000050	.000005	.000005	
11,000	11,000	.000510	.000055	.....	.....	
12,000	12,000	.000565	.000055	.000020	.000015	
13,000	13,000	.000635	.000070	.....	.....	
14,000	14,000	.000700	.000065	.000045	.000025	
15,000	15,000	.000755	.000055	.....	.....	
16,000	16,000	.000825	.000070	.000060	.000015	
17,000	17,000	.000880	.000055	.....	.....	
18,000	18,000	.000945	.000065	.000075	.000015	
19,000	19,000	.001005	.000060	.....	.....	
20,000	20,000	.001050	.000045	.....	.....	Tensile strength.

Fractured at neck. Appearance granular, with coarse dark spangles.

No. 1091.

Marks, $^{12\,M\,B_{B}\,T\,B_{2}}_{B\,T_{2}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006	.....	.....	
3,000	3,000	.00010	.00004	.....	.....	
4,000	4,000	.00014	.00004	.....	.....	
5,000	5,000	.00018	.00004	0.	.....	
6,000	6,000	.00022	.00004	.....	.....	
7,000	7,000	.00028	.00006	.....	.....	
8,000	8,000	.00032	.00004	.....	.....	
9,000	9,000	.00036	.00004	.....	.....	
10,000	10,000	.00042	.00006	.00002	.00002	
11,000	11,000	.00048	.00006	.....	.....	
12,000	12,000	.00054	.00006	.....	.....	
13,000	13,000	.00060	.00006	.....	.....	
14,000	14,000	.00068	.00008	.....	.....	
15,000	15,000	.00072	.00004	.00004	.00002	
16,000	16,000	.00080	.00008	.....	.....	
17,000	17,000	.00086	.00006	.....	.....	
18,000	18,000	.00092	.00006	.....	.....	
19,000	19,000	.00098	.00006	.....	.....	
20,000	20,000	.00104	.00006	.00010	.00006	
21,000	21,000	.00112	.00008	.....	.....	
22,000	22,000	.00120	.00008	.....	.....	
23,000	23,000	.00128	.00008	.....	.....	
24,000	24,000	.00136	.00008	.....	.....	
25,000	25,000	.00144	.00008	.00022	.00012	
26,000	26,000	.00152	.00008	.....	.....	
27,000	27,000	.00162	.00010	.....	.....	
28,000	28,000	.00172	.00010	.....	.....	
29,000	29,000	.00186	.00014	.....	.....	
30,000	30,000	.00200	.00014	.00050	.00028	
31,000	31,000	.00220	.00020	.....	.....	
32,000	32,000	.00232	.00012	.....	.....	
33,000	33,000	.00256	.00024	.....	.....	
34,000	34,000	.00280	.00024	.....	.....	
35,000	35,000	.00312	.00032	.00138	.00088	
36,000	36,000	.00348	.00036	.....	.....	
37,000	37,000	.00382	.00034	.....	.....	
38,000	38,000	.00424	.00042	.....	.....	
39,000	39,000	.00480	.00056	.....	.....	
40,000	40,000	.00540	.00060	.00382	.00194	
41,000	41,000	.00596	.00056	.....	.....	
42,000	42,000	.00638	.00042	.....	.....	
43,000	43,000	.00694	.00056	.....	.....	
44,000	44,000	.00792	.00098	.....	.....	
45,000	45,000	.00884	.00092	.00642	.00310	
46,000	46,000	.00966	.00082	.....	.....	
47,000	47,000	.01048	.00082	.....	.....	
48,000	48,000	.01172	.00124	.....	.....	
49,000	49,000	.01284	.00112	.....	.....	
50,000	50,000	.01384	.00100	.01120	.00478	
57,080	57,080	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 1092.

Marks, $\frac{12\ M\ R_{21}\ T\ R_2}{B\ R_{20}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00010	.00006	.....	.....	
4,000	4,000	.00014	.00004	.....	.....	
5,000	5,000	.00018	.00004	0.	.....	
6,000	6,000	.00024	.00006	.....	.....	
7,000	7,000	.00028	.00004	.....	.....	
8,000	8,000	.00032	.00004	.....	.....	
9,000	9,000	.00038	.00006	.....	.....	
10,000	10,000	.00044	.00006	.00002	.00002	
11,000	11,000	.00050	.00006	.....	.....	
12,000	12,000	.00054	.00004	.....	.....	
13,000	13,000	.00062	.00008	.....	.....	
14,000	14,000	.00066	.00004	.....	.....	
15,000	15,000	.00072	.00006	.00004	.00002	
16,000	16,000	.00076	.00004	.....	.....	
17,000	17,000	.00084	.00008	.....	.....	
18,000	18,000	.00090	.00006	.....	.....	
19,000	19,000	.00096	.00006	.....	.....	
20,000	20,000	.00104	.00008	.00010	.00006	
21,000	21,000	.00112	.00008	.....	.....	
22,000	22,000	.00118	.00006	.....	.....	
23,000	23,000	.00124	.00006	.....	.....	
24,000	24,000	.00132	.00008	.....	.....	
25,000	25,000	.00140	.00008	.00022	.00012	
26,000	26,000	.00150	.00010	.....	.....	
27,000	27,000	.00158	.00008	.....	.....	
28,000	28,000	.00163	.00010	.....	.....	
29,000	29,000	.00180	.00012	.....	.....	
30,000	30,000	.00192	.00012	.00050	.00028	
31,000	31,000	.00208	.00016	.....	.....	
32,000	32,000	.00226	.00018	.....	.....	
33,000	33,000	.00250	.00024	.....	.....	
34,000	34,000	.00276	.00026	.....	.....	
35,000	35,000	.00314	.00038	.00140	.00090	
36,000	36,000	.00342	.00028	.....	.....	
37,000	37,000	.00376	.00034	.....	.....	
38,000	38,000	.00422	.00046	.....	.....	
39,000	39,000	.00458	.00036	.....	.....	
40,000	40,000	.00520	.00062	.00322	.00182	
41,000	41,000	.00580	.00060	.....	.....	
42,000	42,000	.00612	.00032	.....	.....	
43,000	43,000	.00672	.00060	.....	.....	
44,000	44,000	.00716	.00044	.....	.....	
45,000	45,000	.00798	.00082	.00568	.00246	
46,000	46,000	.00854	.00056	.....	.....	
47,000	47,000	.00920	.00066	.....	.....	
48,000	48,000	.00966	.00046	.....	.....	
49,000	49,000	.01020	.00054	.....	.....	
50,000	50,000	.01068	.00048	.00810	.00242	
57,990	57,990	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 1093.

Marks, $\frac{12\,M\,R_{21}\,T\,R_1}{M\,T_{28}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00008	.00004	.....	.....	
4,000	4,000	.00012	.00004	.....	.....	
5,000	5,000	.00016	.00004	0.	.....	
6,000	6,000	.00022	.00006	.....	.....	
7,000	7,000	.00028	.00006	.....	.....	
8,000	8,000	.00034	.00006	.....	.....	
9,000	9,000	.00040	.00006	.....	.....	
10,000	10,000	.00046	.00006	0.	.....	
11,000	11,000	.00050	.00004	.....	.....	
12,000	12,000	.00056	.00006	.....	.....	
13,000	13,000	.00062	.00006	.....	.....	
14,000	14,000	.00068	.00006	.....	.....	
15,000	15,000	.00074	.00006	.00004	.00004	
16,000	16,000	.00080	.00006	.....	.....	
17,000	17,000	.00084	.00004	.....	.....	
18,000	18,000	.00092	.00008	.....	.....	
19,000	19,000	.00098	.00006	.....	.....	
20,000	20,000	.00104	.00006	.00008	.00004	
21,000	21,000	.00112	.00008	.....	.....	
22,000	22,000	.00118	.00006	.....	.....	
23,000	23,000	.00124	.00006	.....	.....	
24,000	24,000	.00132	.00008	.....	.....	
25,000	25,000	.00142	.00010	.00018	.00010	
26,000	26,000	.00150	.00008	.....	.....	
27,000	27,000	.00158	.00008	.....	.....	
28,000	28,000	.00168	.00010	.....	.....	
29,000	29,000	.00180	.00012	.....	.....	
30,000	30,000	.00190	.00010	.00040	.00022	
31,000	31,000	.00204	.00014	.....	.....	
32,000	32,000	.00216	.00012	.....	.....	
33,000	33,000	.00232	.00016	.....	.....	
34,000	34,000	.00254	.00022	.....	.....	
35,000	35,000	.00280	.00026	.00100	.00060	
36,000	36,000	.00302	.00022	.....	.....	
37,000	37,000	.00324	.00022	.....	.....	
38,000	38,000	.00360	.00036	.....	.....	
39,000	39,000	.00386	.00026	.....	.....	
40,000	40,000	.00424	.00038	.00222	.00122	
41,000	41,000	.00478	.00054	.....	.....	
42,000	42,000	.00520	.00042	.....	.....	
43,000	43,000	.00566	.00046	.....	.....	
44,000	44,000	.00606	.00040	.....	.....	
45,000	45,000	.00666	.00060	.00438	.00216	
46,000	46,000	.00714	.00048	.....	.....	
47,000	47,000	.00748	.00034	.....	.....	
48,000	48,000	.00796	.00048	.....	.....	
49,000	49,000	.00846	.00050	.....	.....	
50,000	50,000	.00888	.00042	.00638	.00200	
56,960	56,960	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 4841.

Marks, $\frac{12\ M\ R_{21}\ T\ R_2}{B\ T_{21}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000115	.000065	.....	.....	
4,000	4,000	.000175	.000060	.....	.....	
5,000	5,000	.000240	.000065	0.	.....	
6,000	6,000	.000300	.000060	.....	.....	
7,000	7,000	.000365	.000065	.....	.....	
8,000	8,000	.000435	.000070	.....	.....	
9,000	9,000	.000505	.000070	.....	.....	
10,000	10,000	.000585	.000080	.000040	.000040	
11,000	11,000	.000660	.000075	.....	.....	
12,000	12,000	.000745	.000085	.000090	.000050	
13,000	13,000	.000845	.000100	.....	.....	
14,000	14,000	.000940	.000095	.000135	.000045	
15,000	15,000	.001050	.000110	.....	.....	
16,000	16,000	.001180	.000130	.000210	.000075	
17,000	17,000	.001290	.000110	.....	.....	
18,000	18,000	.001430	.000140	.000325	.000115	
19,000	19,000	.001630	.000200	.....	.....	
20,000	20,000	.001830	.000200	.000580	.000205	
21,000	21,000	.002040	.000210	.....	.....	
22,000	22,000	.002300	.000260	.000840	.000310	
23,000	23,000	.002640	.000340	.....	.....	
24,000	24,000	.003015	.000375	.001315	.000505	
25,000	25,000	.003510	.000500	.001745	.000400	
25,410	25,410	.....	.....	.....	.....	Tensile strength.

Fractured 2″ from neck. Appearance dark granular.

No. 4842.

Marks, $\frac{12\ M\ R_1}{M\ T_{31}}\ T\ R_1$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000200	.000050	0.	.....	
6,000	6,000	.000255	.000055	.....	.....	
7,000	7,000	.000305	.000050	.....	.....	
8,000	8,000	.000360	.000055	.....	.....	
9,000	9,000	.000410	.000050	.....	.....	
10,000	10,000	.000470	.000060	.000010	.000010	
11,000	11,000	.000540	.000070	.....	.....	
12,000	12,000	.000605	.000065	.000050	.000040	
13,000	13,000	.000675	.000070	.....	.....	
14,000	14,000	.000750	.000075	.000065	.000015	
15,000	15,000	.000835	.000085	.....	.....	
16,000	16,000	.000915	.000080	.000105	.000040	
17,000	17,000	.001010	.000095	.....	.....	
18,000	18,000	.001130	.000120	.000195	.000090	
19,000	19,000	.001250	.000120	.....	.....	
20,000	20,000	.001390	.000140	.000305	.000110	
21,000	21,000	.001550	.000160	.....	.....	
22,000	22,000	.001750	.000200	.000510	.000205	
23,000	23,000	.001975	.000225	.....	.....	
24,000	24,000	.002190	.000215	.000810	.000300	
25,000	25,000	.002500	.000310	.001050	.000240	
25,970	25,970	.....	.....	.....	.....	Tensile strength.

Fractured 10″.2 from neck. Appearance dark granular.

No. 1094.

Marks, $\frac{12\ M\ R_1\ T\ R_2}{B\ T_{32}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00010	.00006	.....	.....	
4,000	4,000	.00014	.00004	.....	.....	
5,000	5,000	.00018	.00004	0.	.....	
6,000	6,000	.00020	.00002	.....	.....	
7,000	7,000	.00024	.00004	.....	.....	
8,000	8,000	.00028	.00004	.....	.....	
9,000	9,000	.00032	.00004	.....	.....	
10,000	10,000	.00034	.00002	0.	.....	
11,000	11,000	.00038	.00004	.....	.....	
12,000	12,000	.00042	.00004	.....	.....	
13,000	13,000	.00046	.00004	.....	.....	
14,000	14,000	.00052	.00006	.....	.....	
15,000	15,000	.00056	.00004	0.	.....	
16,000	16,000	.00062	.00006	.....	.....	
17,000	17,000	.00068	.00006	.....	.....	
18,000	18,000	.00074	.00006	.....	.....	
19,000	19,000	.00080	.00006	.....	.....	
20,000	20,000	.00084	.00004	.00004	.00004	
21,000	21,000	.00094	.00010	.....	.....	
22,000	22,000	.00102	.00008	.....	.....	
23,000	23,000	.00110	.00008	.....	.....	
24,000	24,000	.00118	.00008	.....	.....	
25,000	25,000	.00128	.00010	.00022	.00018	
26,000	26,000	.00140	.00012	.....	.....	
27,000	27,000	.00150	.00010	.....	.....	
28,000	28,000	.00164	.00014	.....	.....	
29,000	29,000	.00178	.00014	.....	.....	
30,000	30,000	.00196	.00018	.00054	.00032	
31,000	31,000	.00216	.00020	.....	.....	
32,000	32,000	.00234	.00018	.....	.....	
33,000	33,000	.00254	.00020	.....	.....	
34,000	34,000	.00282	.00028	.....	.....	
35,000	35,000	.00316	.00034	.00150	.00096	
36,000	36,000	.00352	.00036	.....	.....	
37,000	37,000	.00378	.00026	.....	.....	
38,000	38,000	.00412	.00033	.....	.....	
39,000	39,000	.00458	.00046	.....	.....	
40,000	40,000	.00510	.00052	.00298	.00148	
41,000	41,000	.00558	.00048	.....	.....	
42,000	42,000	.00596	.00038	.....	.....	
43,000	43,000	.00648	.00052	.....	.....	
44,000	44,000	.00700	.00052	.....	.....	
45,000	45,000	.00754	.00054	.00506	.00208	
46,000	46,000	.00808	.00054	.....	.....	
47,000	47,000	.00856	.00048	.....	.....	
48,000	48,000	.00904	.00048	.....	.....	
49,000	49,000	.00936	.00032	.....	.....	
50,000	50,000	.00964	.00028	.00696	.00190	
57,780	57,780	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 1095.

Marks, $^{12\ M\ R_{21}\ T\ R_2}_{B\ R_{20}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004			
3,000	3,000	.00008	.00004			
4,000	4,000	.00012	.00004			
5,000	5,000	.00016	.00006	0.		
6,000	6,000	.00022	.00004			
7,000	7,000	.00026	.00004			
8,000	8,000	.00030	.00004			
9,000	9,000	.00034	.00004			
10,000	10,000	.00038	.00004	0.		
11,000	11,000	.00042	.00004			
12,000	12,000	.00046	.00004			
13,000	13,000	.00050	.00004			
14,000	14,000	.00054	.00004			
15,000	15,000	.00060	.00006	.00008	.00008	
16,000	16,000	.00068	.00008			
17,000	17,000	.00078	.00010			
18,000	18,000	.00084	.00006			
19,000	19,000	.00092	.00008			
20,000	20,000	.00100	.00008	.00018	.00010	
21,000	21,000	.00110	.00010			
22,000	22,000	.00118	.00008			
23,000	23,000	.00124	.00006			
24,000	24,000	.00134	.00010			
25,000	25,000	.00144	.00010	.00036	.00018	
26,000	26,000	.00160	.00016			
27,000	27,000	.00174	.00014			
28,000	28,000	.00188	.00014			
29,000	29,000	.00202	.00014			
30,000	30,000	.00222	.00020	.00084	.00048	
31,000	31,000	.00246	.00024			
32,000	32,000	.00268	.00022			
33,000	33,000	.00296	.00028			
34,000	34,000	.00322	.00026			
35,000	35,000	.00358	.00036	.00192	.00108	
36,000	36,000	.00400	.00042			
37,000	37,000	.00440	.00040			
38,000	38,000	.00476	.00036			
39,000	39,000	.00522	.00046			
40,000	40,000	.00580	.00058	.00382	.00190	
41,000	41,000	.00672	.00092			Rested under load 3 minutes.
42,000	42,000	.00702	.00030			
43,000	43,000	.00740	.00038			
44,000	44,000	.00800	.00060			
45,000	45,000	.00860	.00060	.00614	.00232	
46,000	46,000	.00946	.00086			
47,000	47,000	.01018	.00072			
48,000	48,000	.01088	.00070			
49,000	49,000	.01198	.00110			
50,000	50,000	.01302	.00104	.01002	.00388	
57,240	57,240					Ultimate strength.

Failed by triple flexure.

No. 1096.

Marks, $\frac{12\,M\,R_2\,T\,R_1}{M\,T_2}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00002	.00002	.....	.....	
3,000	3,000	.00006	.00004	.....	.....	
4,000	4,000	.00008	.00002	.....	.....	
5,000	5,000	.00012	.00004	0.	.....	
6,000	6,000	.00016	.00004	.....	.....	
7,000	7,000	.00020	.00004	.....	.....	
8,000	8,000	.00024	.00004	.....	.....	
9,000	9,000	.00028	.00004	.....	.....	
10,000	10,000	.00034	.00006	.00004	.00004	
11,000	11,000	.00038	.00004	.....	.....	
12,000	12,000	.00042	.00004	.....	.....	
13,000	13,000	.00048	.00006	.....	.....	
14,000	14,000	.00056	.00008	.....	.....	
15,000	15,000	.00062	.00006	.00012	.00008	
16,000	16,000	.00070	.00008	.....	.....	
17,000	17,000	.00076	.00006	.....	.....	
18,000	18,000	.00080	.00004	.....	.....	
19,000	19,000	.00088	.00008	.....	.....	
20,000	20,000	.00094	.00006	.00024	.00012	
21,000	21,000	.00102	.00008	.....	.....	
22,000	22,000	.00110	.00008	.....	.....	
23,000	23,000	.00116	.00006	.....	.....	
24,000	24,000	.00122	.00006	.....	.....	
25,000	25,000	.00130	.00008	.00040	.00016	
26,000	26,000	.00144	.00014	.....	.....	
27,000	27,000	.00154	.00010	.....	.....	
28,000	28,000	.00162	.00008	.....	.....	
29,000	29,000	.00174	.00012	.....	.....	
30,000	30,000	.00190	.00016	.00072	.00032	
31,000	31,000	.00212	.00022	.....	.....	
32,000	32,000	.00230	.00018	.....	.....	
33,000	33,000	.00250	.00020	.....	.....	
34,000	34,000	.00274	.00024	.....	.....	
35,000	35,000	.00304	.00030	.00162	.00090	
36,000	36,000	.00340	.00036	.....	.....	
37,000	37,000	.00380	.00040	.....	.....	
38,000	38,000	.00416	.00036	.....	.....	
39,000	39,000	.00464	.00048	.....	.....	
40,000	40,000	.00518	.00054	.00342	.00180	
41,000	41,000	.00570	.00052	.....	.....	
42,000	42,000	.00616	.00046	.....	.....	
43,000	43,000	.00664	.00048	.....	.....	
44,000	44,000	.00716	.00052	.....	.....	
45,000	45,000	.00762	.00046	.00558	.00216	
46,000	46,000	.00826	.00064	.....	.....	
47,000	47,000	.00874	.00048	.....	.....	
48,000	48,000	.00904	.00030	.....	.....	
49,000	49,000	.00938	.00034	.....	.....	
50,000	50,000	.00956	.00022	.00724	.00166	
58,911	58,910	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 4862.

Marks, $\frac{12\ M\ R_2\ T\ R_2}{B\ T_{11}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.5.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000055	.000055	.....	.....	
3,000	3,000	.000105	.000050	.....	.....	
4,000	4,000	.000160	.000055	.....	.....	
5,000	5,000	.000215	.000055	0.	.....	
6,000	6,000	.000275	.000060	.....	.....	
7,000	7,000	.000335	.000060	.....	.....	
8,000	8,000	.000395	.000060	.....	.....	
9,000	9,000	.000455	.000060	.....	.....	
10,000	10,000	.000525	.000070	.000010	.000010	
11,000	11,000	.000600	.000075	.....	.....	
12,000	12,000	.000675	.000075	.000045	.000035	
13,000	13,000	.000750	.000075	.....	.....	
14,000	14,000	.000845	.000095	.000085	.000040	
15,000	15,000	.000945	.000100	.....	.....	
16,000	16,000	.001040	.000095	.000150	.000065	
17,000	17,000	.001155	.000115	.....	.....	
18,000	18,000	.001280	.000125	.000245	.000095	
19,000	19,000	.001420	.000140	.....	.....	
20,000	20,000	.001595	.000175	.000395	.000150	
21,000	21,000	.001800	.000205	.....	.....	
22,000	22,000	.001990	.000190	.000610	.000215	
23,000	23,000	.002275	.000285	.....	.....	
24,000	24,000	.002615	.000340	.001050	.000440	
24,100	24,100	.....	.....	.....	.....	Tensile strength.

Fractured 9″.6 from neck. Appearance granular, dark spangles.

No. 4863,

Marks, $^{12}\,\mathrm{M}\,\mathrm{R}_{\mathrm{M}}\,\mathrm{T}\,\mathrm{R}_{1}$ / $\mathrm{M}\,\mathrm{T}_{11}$

Diameter, 1″.129.

Sectional area, 1 square inch.

Length of stem, 23″.

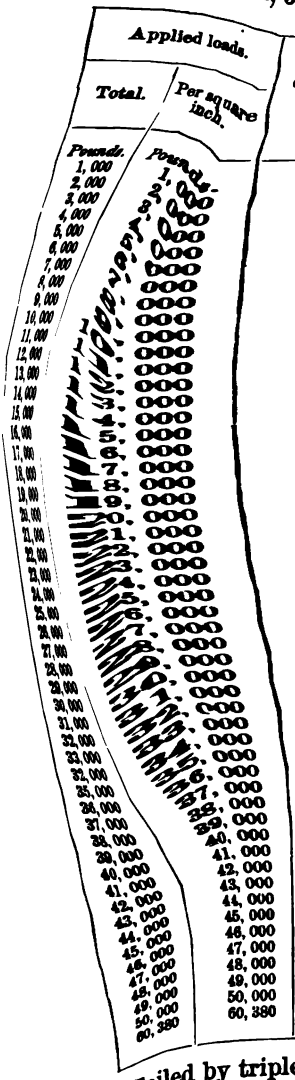
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000055	.000055	.....	.....	
3,000	3,000	.000105	.000050	.....	.....	
4,000	4,000	.000155	.000050	.....	.....	
5,000	5,000	.000205	.000050	.000005	.000005	
6,000	6,000	.000265	.000060	.....	.....	
7,000	7,000	.000320	.000055	.....	.....	
8,000	8,000	.000370	.000050	.....	.....	
9,000	9,000	.000435	.000065	.....	.....	
10,000	10,000	.000495	.000060	.000035	.000030	
11,000	11,000	.000550	.000055	.....	.....	
12,000	12,000	.000605	.000055	.000050	.000015	
13,000	13,000	.000660	.000055	.....	.....	
14,000	14,000	.000745	.000085	.000060	.000010	
15,000	15,000	.000805	.000060	.....	.....	
16,000	16,000	.000890	.000085	.000100	.000040	
17,000	17,000	.000955	.000065	.....	.....	
18,000	18,000	.001055	.000100	.000150	.000050	
19,000	19,000	.001150	.000095	.....	.....	
20,000	20,000	.001255	.000105	.000225	.000075	
21,000	21,000	.001400	.000145	.....	.....	
22,000	22,000	.001500	.000100	.000345	.000120	
23,000	23,000	.001690	.000190	.....	.....	
24,000	24,000	.001850	.000160	.000545	.000200	
25,000	25,000	.002070	.000220	.000700	.000155	
28,540	28,540	.....	.....	.....	.....	Tensile strength.

Fractured at neck. Appearance granular.

No. 1097.

Marks, $^{12\ M\ R_1\ T\ R_2}_{R\ T_{12}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.



Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Inch.	*Inch.*	*Inch.*	*Inch.*	
0.	0.	0.	0.	Initial load.
.00004	.00004			
.00010	.00006			
.00016	.00006			
.00020	.00004	0.		
.00026	.00006			
.00032	.00006			
.00036	.00004			
.00042	.00006			
.00043	.00006	.00002	.00002	
.00052	.00004			
.00060	.00008			
.00066	.00006			
.00072	.00006			
.00080	.00008	.00006	.00006	
.00086	.00006			
.00094	.00008			
.00100	.00006			
.00106	.00006			
.00114	.00008	.00018	.00010	
.00122	.00008			
.00130	.00008			
.00138	.00008			
.00144	.00006			
.00154	.00010	.00030	.00012	
.00166	.00012			
.00176	.00010			
.00188	.00012			
.00202	.00014			
.00220	.00018	.00064	.00034	
.00236	.00016			
.00256	.00020			
.00274	.00018			
.00300	.00026			
.00330	.00030	.00144	.00080	
.00362	.00032			
.00398	.00036			
.00432	.00034			
.00474	.00042			
.00532	.00058	.00318	.00174	
.00580	.00048			
.00616	.00036			
.00664	.00048			
.00730	.00066			
.00782	.00052	.00538	.00220	
.00840	.00058			
.00896	.00056			
.00960	.00064			
.01038	.00078			
.01110	.00072	.00826	.00288	
.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 1098.

Marks, $^{12\,M\,R_2\,T\,R_2}_{B\,R_{20}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00008	.00004	.....	.....	
4,000	4,000	.00014	.00006	.....	.....	
5,000	5,000	.00020	.00006	0.	.....	
6,000	6,000	.00024	.00004	.....	.....	
7,000	7,000	.00030	.00006	.....	.....	
8,000	8,000	.00034	.00004	.....	.....	
9,000	9,000	.00040	.00006	.....	.....	
10,000	10,000	.00044	.00004	.00002	.00002	
11,000	11,000	.00050	.00006	.....	.....	
12,000	12,000	.00056	.00006	.....	.....	
13,000	13,000	.00062	.00006	.....	.....	
14,000	14,000	.00070	.00008	.....	.....	
15,000	15,000	.00074	.00004	.00004	.00002	
16,000	16,000	.00080	.00006	.....	.....	
17,000	17,000	.00086	.00006	.....	.....	
18,000	18,000	.00094	.00008	.....	.....	
19,000	19,000	.00100	.00006	.....	.....	
20,000	20,000	.00104	.00004	.00012	.00008	
21,000	21,000	.00112	.00008	.....	.....	
22,000	22,000	.00120	.00008	.....	.....	
23,000	23,000	.00128	.00008	.....	.....	
24,000	24,000	.00138	.00010	.....	.....	
25,000	25,000	.00144	.00006	.00022	.00010	
26,000	26,000	.00154	.00010	.....	.....	
27,000	27,000	.00164	.00010	.....	.....	
28,000	28,000	.00178	.00014	.....	.....	
29,000	29,000	.00188	.00010	.....	.....	
30,000	30,000	.00202	.00014	.00052	.00030	
31,000	31,000	.00218	.00016	.....	.....	
32,000	32,000	.00234	.00016	.....	.....	
33,000	33,000	.00254	.00020	.....	.....	
34,000	34,000	.00278	.00024	.....	.....	
35,000	35,000	.00304	.00026	.00126	.00074	
36,000	36,000	.00336	.00032	.....	.....	
37,000	37,000	.00366	.00030	.....	.....	
38,000	38,000	.00416	.00050	.....	.....	
39,000	39,000	.00448	.00032	.....	.....	
40,000	40,000	.00484	.00036	.00280	.00154	
41,000	41,000	.00530	.00046	.....	.....	
42,000	42,000	.00570	.00040	.....	.....	
43,000	43,000	.00614	.00044	.....	.....	
44,000	44,000	.00658	.00044	.....	.....	
45,000	45,000	.00696	.00038	.00460	.00180	
46,000	46,000	.00738	.00042	.....	.....	Defects, convex on the micrometer side.
47,000	47,000	.00762	.00024	.....	.....	
48,000	48,000	.00784	.00022	.....	.....	
49,000	49,000	.00798	.00014	.....	.....	
50,000	50,000	.00806	.00008	.00564	.00104	
57,300	57,300	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 1099.

Marks, $^{12\ M\ R_{24}\ T\ R_1}_{M\ T_{12}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00008	.00004	.....	.....	
4,000	4,000	.00014	.00006	.....	.....	
5,000	5,000	.00018	.00004	0.	.....	
6,000	6,000	.00024	.00006	.....	.....	
7,000	7,000	.00028	.00004	.....	.....	
8,000	8,000	.00034	.00006	.....	.....	
9,000	9,000	.00038	.00004	.....	.....	
10,000	10,000	.00044	.00006	.00002	.00002	
11,000	11,000	.00050	.00006	.....	.....	
12,000	12,000	.00056	.00006	.....	.....	
13,000	13,000	.00062	.00006	.....	.....	
14,000	14,000	.00068	.00006	.....	.....	
15,000	15,000	.00072	.00004	.00006	.00004	
16,000	16,000	.00078	.00006	.....	.....	
17,000	17,000	.00086	.00008	.....	.....	
18,000	18,000	.00092	.00006	.....	.....	
19,000	19,000	.00098	.00006	.....	.....	
20,000	20,000	.00104	.00006	.00012	.00006	
21,000	21,000	.00112	.00008	.....	.....	
22,000	22,000	.00118	.00006	.....	.....	
23,000	23,000	.00124	.00006	.....	.....	
24,000	24,000	.00132	.00008	.....	.....	
25,000	25,000	.00140	.00008	.00024	.00012	
26,000	26,000	.00152	.00012	.....	.....	
27,000	27,000	.00164	.00012	.....	.....	
28,000	28,000	.00174	.00010	.....	.....	
29,000	29,000	.00186	.00012	.....	.....	
30,000	30,000	.00198	.00012	.00052	.00028	
31,000	31,000	.00216	.00018	.....	.....	
32,000	32,000	.00236	.00020	.....	.....	
33,000	33,000	.00258	.00022	.....	.....	
34,000	34,000	.00280	.00022	.....	.....	
35,000	35,000	.00308	.00028	.00136	.00084	
36,000	36,000	.00342	.00034	.....	.....	
37,000	37,000	.00378	.00036	.....	.....	
38,000	38,000	.00418	.00040	.....	.....	
39,000	39,000	.00464	.00046	.....	.....	
40,000	40,000	.00506	.00042	.00306	.00170	
41,000	41,000	.00556	.00050	.....	.....	
42,000	42,000	.00604	.00048	.....	.....	
43,000	43,000	.00650	.00046	.....	.....	
44,000	44,000	.00704	.00054	.....	.....	
45,000	45,000	.00742	.00038	.00514	.00208	
46,000	46,000	.00794	.00052	.....	.....	
47,000	47,000	.00840	.00046	.....	.....	
48,000	48,000	.00880	.00040	.....	.....	
49,000	49,000	.00918	.00038	.....	.....	
50,000	50,000	.00956	.00038	.00704	.00190	
58,300	58,300	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 4878.

Marks, $^{12}\,\mathrm{M}\,\mathrm{R}_{\mathrm{B}}^{\mathrm{T}}\,\mathrm{T}\,\mathrm{R}_{1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000095	.000045	.....	.....	
4,000	4,000	.000145	.000050	.....	.....	
5,000	5,000	.000195	.000050	0.	.....	
6,000	6,000	.000245	.000050	.....	.....	
7,000	7,000	.000295	.000050	.....	.....	
8,000	8,000	.000345	.000050	.....	.....	
9,000	9,000	.000395	.000050	.....	.....	
10,000	10,000	.000450	.000055	.000015	.000015	
11,000	11,000	.000500	.000050	.....	.....	
12,000	12,000	.000550	.000050	.000020	.000005	
13,000	13,000	.000610	.000060	.....	.....	
14,000	14,000	.000665	.000055	.000045	.000025	
15,000	15,000	.000735	.000070	.....	.....	
16,000	16,000	.000805	.000070	.000060	.000015	
17,000	17,000	.000885	.000080	.....	.....	
18,000	18,000	.000950	.000065	.000093	.000035	
19,000	19,000	.001010	.000060	.....	.....	
20,000	20,000	.001105	.000095	.000145	.000050	
21,000	21,000	.001230	.000125	.....	.....	
22,000	22,000	.001300	.000070	.000215	.000070	
23,000	23,000	.001420	.000120	.....	.....	
24,000	24,000	.001540	.000120	.000340	.000025	
25,000	25,000	.001685	.000145	.000420	.000080	
30,420	30,420	.....	.....	.....	.....	Tensile strength.

Fractured 1″.8 from neck. Appearance fine granular.

No. 4879.

Marks, $\frac{12\,M\,R_2\,T\,R_1}{M\,T}$,
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000200	.000050	0.	.....	
6,000	6,000	.000250	.000050	.....	.....	
7,000	7,000	.000300	.000050	.....	.....	
8,000	8,000	.000345	.000045	.....	.....	
9,000	9,000	.000395	.000050	.....	.....	
10,000	10,000	.000450	.000055	.000015	.000015	
11,000	11,000	.000500	.000050	.....	.....	
12,000	12,000	.000555	.000055	.000040	.000025	
13,000	13,000	.000610	.000055	.....	.....	
14,000	14,000	.000685	.000075	.000050	.000010	
15,000	15,000	.000745	.000060	.....	.....	
16,000	16,000	.000805	.000060	.000075	.000025	
17,000	17,000	.000870	.000065	.....	.....	
18,000	18,000	.000950	.000080	.000105	.000030	
19,000	19,000	.001025	.000075	.....	.....	
20,000	20,000	.001100	.000075	.000150	.000045	
21,000	21,000	.001200	.000100	.....	.....	
22,000	22,000	.001295	.000095	.000215	.000065	
23,000	23,000	.001400	.000105	.....	.....	
24,000	24,000	.001545	.000145	.000340	.000125	
25,000	25,000	.001695	.000150	.000425	.000085	
29,600	29,600	.....	.....	.....	.....	Tensile strength.

Fractured 1″.8 from neck. Appearance fine granular.

No. 1106.

Marks, $^{12\ M\ R_2\ T\ R_2}_{B\ T_2}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004			
3,000	3,000	.00008	.00004			
4,000	4,000	.00014	.00006			
5,000	5,000	.00018	.00004	0.		
6,000	6,000	.00022	.00004			
7,000	7,000	.00026	.00004			
8,000	8,000	.00030	.00004			
9,000	9,000	.00036	.00006			
10,000	10,000	.00040	.00004	.00002	.00002	
11,000	11,000	.00044	.00004			
12,000	12,000	.00050	.00006			
13,000	13,000	.00054	.00004			
14,000	14,000	.00058	.00004			
15,000	15,000	.00064	.00006	.00004	.00002	
16,000	16,000	.00070	.00006			
17,000	17,000	.00074	.00004			
18,000	18,000	.00080	.00006			
19,000	19,000	.00086	.00006			
20,000	20,000	.00092	.00006	.00012	.00008	
21,000	21,000	.00098	.00006			
22,000	22,000	.00104	.00006			
23,000	23,000	.00112	.00008			
24,000	24,000	.00118	.00006			
25,000	25,000	.00124	.00006	.00018	.00006	
26,000	26,000	.00132	.00008			
27,000	27,000	.00140	.00008			
28,000	28,000	.00146	.00006			
29,000	29,000	.00154	.00008			
30,000	30,000	.00164	.00010	.00036	.00018	
31,000	31,000	.00172	.00008			
32,000	32,000	.00186	.00014			
33,000	33,000	.00200	.00014			
34,000	34,000	.00220	.00020			
35,000	35,000	.00240	.00020	.00084	.00048	
36,000	36,000	.00264	.00024			
37,000	37,000	.00292	.00028			
38,000	38,000	.00322	.00030			
39,000	39,000	.00360	.00038			
40,000	40,000	.00398	.00038	.00216	.00132	
41,000	41,000	.00430	.00032			
42,000	42,000	.00464	.00034			
43,000	43,000	.00516	.00052			
44,000	44,000	.00560	.00044			
45,000	45,000	.00602	.00042	.00396	.00180	
46,000	46,000	.00640	.00038			
47,000	47,000	.00684	.00044			
48,000	48,000	.00730	.00046			
49,000	49,000	.00780	.00050			
50,000	50,000	.00842	.00062	.00600	.00204	
68,680	68,680					Ultimate strength.

Failed by triple flexure.

No. 1107.

Marks, $\frac{12\,M\,R_{24}\,T\,R_2}{B\,R_{10}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00008	.00004	.....	.....	
4,000	4,000	.00012	.00004	.....	.....	
5,000	5,000	.00018	.00006	.00002	.00002	
6,000	6,000	.00022	.00004	.....	.....	
7,000	7,000	.00026	.00004	.....	.....	
8,000	8,000	.00030	.00004	.....	.....	
9,000	9,000	.00036	.00006	.....	.....	
10,000	10,000	.00042	.00006	.00004	.00002	
11,000	11,000	.00046	.00004	.....	.....	
12,000	12,000	.00052	.00006	.....	.....	
13,000	13,000	.00058	.00006	.....	.....	
14,000	14,000	.00062	.00004	.....	.....	
15,000	15,000	.00066	.00004	.00006	.00002	
16,000	16,000	.00072	.00006	.....	.....	
17,000	17,000	.00078	.00006	.....	.....	
18,000	18,000	.00082	.00004	.....	.....	
19,000	19,000	.00090	.00008	.....	.....	
20,000	20,000	.00096	.00006	.00012	.00006	
21,000	21,000	.00102	.00006	.....	.....	
22,000	22,000	.00108	.00006	.....	.....	
23,000	23,000	.00116	.00008	.....	.....	
24,000	24,000	.00122	.00006	.....	.....	
25,000	25,000	.00126	.00004	.00018	.00006	
26,000	26,000	.00134	.00008	.....	.....	
27,000	27,000	.00142	.00008	.....	.....	
28,000	28,000	.00150	.00008	.....	.....	
29,000	29,000	.00160	.00010	.....	.....	
30,000	30,000	.00168	.00008	.00036	.00018	
31,000	31,000	.00180	.00012	.....	.....	
32,000	32,000	.00196	.00016	.....	.....	
33,000	33,000	.00210	.00014	.....	.....	
34,000	34,000	.00226	.00016	.....	.....	
35,000	35,000	.00244	.00018	.00088	.00052	
36,000	36,000	.00270	.00026	.....	.....	
37,000	37,000	.00296	.00026	.....	.....	
38,000	38,000	.00326	.00030	.....	.....	
39,000	39,000	.00362	.00036	.....	.....	
40,000	40,000	.00400	.00038	.00216	.00128	
41,000	41,000	.00444	.00044	.....	.....	
42,000	42,000	.00480	.00036	.....	.....	
43,000	43,000	.00522	.00042	.....	.....	
44,000	44,000	.00570	.00048	.....	.....	
45,000	45,000	.00612	.00042	.00400	.00184	
46,000	46,000	.00660	.00048	.....	.....	
47,000	47,000	.00704	.00044	.....	.....	
48,000	48,000	.00750	.00046	.....	.....	
49,000	49,000	.00798	.00048	.....	.....	
50,000	50,000	.00840	.00042	.00596	.00196	
66,300	66,300			.....	.....	Ultimate strength.

Failed by triple flexure.

No. 1108.

Marks, $^{12\,M\,R_M\,T\,R_1}_{M\,T_2}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00008	.00004	.....	.....	
4,000	4,000	.00012	.00004	.....	.....	
5,000	5,000	.00016	.00004	0.	.....	
6,000	6,000	.00020	.00004	.....	.....	
7,000	7,000	.00024	.00004	.....	.....	
8,000	8,000	.00028	.00004	.....	.....	
9,000	9,000	.00034	.00006	.....	.....	
10,000	10,000	.00040	.00006	.00004	.00004	
11,000	11,000	.00044	.00004	.....	.....	
12,000	12,000	.00050	.00006	.....	.....	
13,000	13,000	.00056	.00006	.....	.....	
14,000	14,000	.00060	.00004	.....	.....	
15,000	15,000	.00064	.00004	.00006	.00002	
16,000	16,000	.00070	.00006	.....	.....	
17,000	17,000	.00076	.00006	.....	.....	
18,000	18,000	.00080	.00004	.....	.....	
19,000	19,000	.00086	.00006	.....	.....	
20,000	20,000	.00092	.00006	.00008	.00002	
21,000	21,000	.00098	.00006	.....	.....	
22,000	22,000	.00102	.00004	.....	.....	
23,000	23,000	.00110	.00008	.....	.....	
24,000	24,000	.00116	.00006	.....	.....	
25,000	25,000	.00120	.00004	.00016	.00008	
26,000	26,000	.00128	.00008	.....	.....	
27,000	27,000	.00136	.00008	.....	.....	
28,000	28,000	.00142	.00006	.....	.....	
29,000	29,000	.00148	.00006	.....	.....	
30,000	30,000	.00158	.00010	.00026	.00010	
31,000	31,000	.00164	.00006	.....	.....	
32,000	32,000	.00174	.00010	.....	.....	
33,000	33,000	.00184	.00010	.....	.....	
34,000	34,000	.00196	.00012	.....	.....	
35,000	35,000	.00212	.00016	.00058	.00032	
36,000	36,000	.00228	.00016	.....	.....	
37,000	37,000	.00242	.00014	.....	.....	
38,000	38,000	.00270	.00028	.....	.....	
39,000	39,000	.00298	.00028	.....	.....	
40,000	40,000	.00320	.00022	.00140	.00082	
41,000	41,000	.00360	.00040	.....	.....	
42,000	42,000	.00390	.00030	.....	.....	
43,000	43,000	.00438	.00048	.....	.....	
44,000	44,000	.00470	.00032	.....	.....	
45,000	45,000	.00510	.00040	.00300	.00160	
46,000	46,000	.00556	.00046	.....	.....	
47,000	47,000	.00602	.00046	.....	.....	
48,000	48,000	.00642	.00040	.....	.....	
49,000	49,000	.00698	.00056	.....	.....	
50,000	50,000	.00736	.00038	.00496	.00196	
69,380	69,380	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 4906.

Marks, $\frac{12\ M\ R_2\ T\ R_2}{B\ T_1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000105	.000055	.....	.....	
4,000	4,000	.000155	.000050	.....	.....	
5,000	5,000	.000210	.000055	.000010	.000010	
6,000	6,000	.000275	.000065	.....	.....	
7,000	7,000	.000345	.000070	.....	.....	
8,000	8,000	.000400	.000055	.....	.....	
9,000	9,000	.000465	.000065	.....	.....	
10,000	10,000	.000540	.000075	.000050	.000040	
11,000	11,000	.000610	.000070	.....	.....	
12,000	12,000	.000695	.000085	.000080	.000030	
13,000	13,000	.000775	.000080	.....	.....	
14,000	14,000	.000880	.000085	.000110	.000030	
15,000	15,000	.000905	.000045	.....	.....	
16,000	16,000	.001025	.000125	.000185	.000075	
17,000	17,000	.001165	.000120	.....	.....	
18,000	18,000	.001300	.000135	.000270	.000085	
19,000	19,000	.001455	.000155	.....	.....	
20,000	20,000	.001625	.000170	.000440	.000170	
21,000	21,000	.001805	.000180	.....	.....	
22,000	22,000	.002050	.000145	.000690	.000250	
23,000	23,000	.002300	.000250	.....	.....	
24,000	24,000	.002550	.000250	.001005	.000315	
24,900	24,900	.....	.....	.....	.....	Tensile strength.

Fractured 3″.60 from neck. Appearance granular.

No. 4905.

Marks, $\frac{12\,M\,R_4}{M\,T_1}$, T R$_1$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 17″.
Gauged length, 10″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000040	.000040	.....	.....	
3,000	3,000	.000100	.000060	.....	.....	
4,000	4,000	.000140	.000040	.....	.....	
5,000	5,000	.000190	.000050	.000010	.000010	
6,000	6,000	.000250	.000060	.....	.....	
7,000	7,000	.000300	.000050	.....	.....	
8,000	8,000	.000380	.000080	.....	.....	
9,000	9,000	.000420	.000040	.....	.....	
10,000	10,000	.000490	.000070	.000030	.000020	
11,000	11,000	.000560	.000070	.....	.....	
12,000	12,000	.000610	.000050	.000080	.000050	
13,000	13,000	.000690	.000080	.....	.....	
14,000	14,000	.000750	.000060	.000090	.000010	
15,000	15,000	.000820	.000070	.....	.....	
16,000	16,000	.000910	.000090	.000110	.000020	
17,000	17,000	.001000	.000090	.....	.....	
18,000	18,000	.001090	.000090	.000170	.000060	
19,000	19,000	.001190	.000100	.....	.....	
20,000	20,000	.001290	.000100	.000220	.000050	
21,000	21,000	.001410	.000120	.....	.....	
22,000	22,000	.001520	.000110	.000320	.000100	
23,000	23,000	.001700	.000180	.....	.....	
24,000	24,000	.001880	.000180	.000510	.000190	
25,000	25,000	.002100	.000220	.000680	.000170	
29,900	29,900	.....	.....	.....	.....	Tensile strength.

Fractured five-eighths inch from neck. Appearance granular.

No. 1118.

Marks, $\frac{12\ M\ R_2}{B\ T_2}\ T\ R_2$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00006	.00002	.....	.....	
4,000	4,000	.00010	.00004	.....	.....	
5,000	5,000	.00016	.00006	—.00005	—.00005	
6,000	6,000	.00022	.00006	.....	.....	
7,000	7,000	.00026	.00004	.....	.....	
8,000	8,000	.00030	.00004	.....	.....	
9,000	9,000	.00036	.00006	.....	.....	
10,000	10,000	.00042	.00006	0.	.00005	
11,000	11,000	.00048	.00006	.....	.....	
12,000	12,000	.00054	.00006	.....	.....	
13,000	13,000	.00060	.00006	.....	.....	
14,000	14,000	.00064	.00004	.....	.....	
15,000	15,000	.00072	.00008	.00002	.00002	
16,000	16,000	.00078	.00006	.....	.....	
17,000	17,000	.00084	.00006	.....	.....	
18,000	18,000	.00090	.00006	.....	.....	
19,000	19,000	.00096	.00006	.....	.....	
20,000	20,000	.00102	.00006	.00008	.00006	
21,000	21,000	.00112	.00010	.....	.....	
22,000	22,000	.00118	.00006	.....	.....	
23,000	23,000	.00124	.00006	.....	.....	
24,000	24,000	.00136	.00012	.....	.....	
25,000	25,000	.00142	.00006	.00020	.00012	
26,000	26,000	.00152	.00010	.....	.....	
27,000	27,000	.00162	.00010	.....	.....	
28,000	28,000	.00174	.00012	.....	.....	
29,000	29,000	.00184	.00010	.....	.....	
30,000	30,000	.00200	.00016	.00050	.00030	
31,000	31,000	.00218	.00018	.....	.....	
32,000	32,000	.00230	.00012	.....	.....	
33,000	33,000	.00252	.00022	.....	.....	
34,000	34,000	.00280	.00028	.....	.....	
35,000	35,000	.00306	.00026	.00134	.00084	
36,000	36,000	.00342	.00036	.....	.....	
37,000	37,000	.00364	.00022	.....	.....	
38,000	38,000	.00400	.00036	.....	.....	
39,000	39,000	.00440	.00040	.....	.....	
40,000	40,000	.00474	.00034	.00276	.00142	
41,000	41,000	.00518	.00044	.....	.....	
42,000	42,000	.00552	.00034	.....	.....	
43,000	43,000	.00596	.00044	.....	.....	
44,000	44,000	.00636	.00040	.....	.....	
45,000	45,000	.00670	.00034	.00448	.00172	
46,000	46,000	.00714	.00044	.....	.....	
47,000	47,000	.00748	.00034	.....	.....	
48,000	48,000	.00782	.00034	.....	.....	
49,000	49,000	.00810	.00028	.....	.....	
50,000	50,000	.00832	.00022	.00588	.00140	
59,800	59,800	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure. Deflected upward at the middle.

No. 1119.

Marks, $\frac{12\,M\,R_{14}\,T\,R_2}{B\,R_{19}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00008	.00004	.....	.....	
4,000	4,000	.00014	.00006	.....	.....	
5,000	5,000	.00018	.00004	0.	.....	
6,000	6,000	.00022	.00004	.....	.....	
7,000	7,000	.00028	.00006	.....	.....	
8,000	8,000	.00032	.00004	.....	.....	
9,000	9,000	.00040	.00008	.....	.....	
10,000	10,000	.00044	.00004	.00002	.00002	
11,000	11,000	.00050	.00006	.....	.....	
12,000	12,000	.00054	.00004	.....	.....	
13,000	13,000	.00060	.00006	.....	.....	
14,000	14,000	.00066	.00006	.....	.....	
15,000	15,000	.00070	.00004	.00004	.00002	
16,000	16,000	.00078	.00008	.....	.....	
17,000	17,000	.00084	.00006	.....	.....	
18,000	18,000	.00088	.00004	.....	.....	
19,000	19,000	.00098	.00010	.....	.....	
20,000	20,000	.00102	.00004	.00010	.00006	
21,000	21,000	.00112	.00010	.....	.....	
22,000	22,000	.00116	.00004	.....	.....	
23,000	23,000	.00124	.00008	.....	.....	
24,000	24,000	.00132	.00008	.....	.....	
25,000	25,000	.00140	.00008	.00022	.00012	
26,000	26,000	.00152	.00012	.....	.....	
27,000	27,000	.00158	.00006	.....	.....	
28,000	28,000	.00170	.00012	.....	.....	
29,000	29,000	.00180	.00010	.....	.....	
30,000	30,000	.00198	.00018	.00054	.00032	
31,000	31,000	.00220	.00022	.....	.....	
32,000	32,000	.00234	.00014	.....	.....	
33,000	33,000	.00256	.00022	.....	.....	
34,000	34,000	.00280	.00024	.....	.....	
35,000	35,000	.00308	.00028	.00138	.00084	
36,000	36,000	.00344	.00036	.....	.....	
37,000	37,000	.00380	.00036	.....	.....	
38,000	38,000	.00414	.00034	.....	.....	
39,000	39,000	.00458	.00044	.....	.....	
40,000	40,000	.00502	.00044	.00304	.00166	
41,000	41,000	.00540	.00038	.....	.....	
42,000	42,000	.00588	.00048	.....	.....	
43,000	43,000	.00622	.00034	.....	.....	
44,000	44,000	.00668	.00046	.....	.....	
45,000	45,000	.00720	.00052	.00492	.00188	
46,000	46,000	.00762	.00042	.....	.....	
47,000	47,000	.00806	.00044	.....	.....	
48,000	48,000	.00850	.00044	.....	.....	
49,000	49,000	.00888	.00038	.....	.....	
50,000	50,000	.00936	.00048	.00678	.00186	
61,700	61,700	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure. Deflected downward at the middle.

No. 1120.

Marks, $^{12}\frac{M\ R_{2}\ T\ R_{1}}{M\ T}$.
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00008	.00004	.....	.....	
4,000	4,000	.00012	.00004	.....	.....	
5,000	5,000	.00016	.00004	0.	.....	
6,000	6,000	.00020	.00004	.....	.....	
7,000	7,000	.00024	.00004	.....	.....	
8,000	8,000	.00028	.00004	.....	.....	
9,000	9,000	.00034	.00006	.....	.....	
10,000	10,000	.00040	.00006	0.	.....	
11,000	11,000	.00042	.00002	.....	.....	
12,000	12,000	.00046	.00004	.....	.....	
13,000	13,000	.00052	.00006	.....	.....	
14,000	14,000	.00058	.00006	.....	.....	
15,000	15,000	.00062	.00004	0.	.....	
16,000	16,000	.00068	.00006	.....	.....	
17,000	17,000	.00074	.00006	.....	.....	
18,000	18,000	.00078	.00004	.....	.....	
19,000	19,000	.00082	.00004	.....	.....	
20,000	20,000	.00086	.00004	.00002	.00002	
21,000	21,000	.00096	.00010	.....	.....	
22,000	22,000	.00102	.00006	.....	.....	
23,000	23,000	.00106	.00004	.....	.....	
24,000	24,000	.00112	.00006	.....	.....	
25,000	25,000	.00116	.00004	.00006	.00004	
26,000	26,000	.00122	.00006	.....	.....	
27,000	27,000	.00130	.00008	.....	.....	
28,000	28,000	.00136	.00006	.....	.....	
29,000	29,000	.00144	.00008	.....	.....	
30,000	30,000	.00152	.00008	.00018	.00012	
31,000	31,000	.00162	.00010	.....	.....	
32,000	32,000	.00170	.00008	.....	.....	
33,000	33,000	.00180	.00010	.....	.....	
34,000	34,000	.00194	.00014	.....	.....	
35,000	35,000	.00204	.00010	.00044	.00026	
36,000	36,000	.00220	.00016	.....	.....	
37,000	37,000	.00238	.00018	.....	.....	
38,000	38,000	.00256	.00018	.....	.....	
39,000	39,000	.00278	.00022	.....	.....	
40,000	40,000	.00300	.00022	.00116	.00072	
41,000	41,000	.00336	.00036	.....	.....	
42,000	42,000	.00356	.00020	.....	.....	
43,000	43,000	.00396	.00040	.....	.....	
44,000	44,000	.00426	.00030	.....	.....	
45,000	45,000	.00468	.00042	.00256	.00140	
46,000	46,000	.00508	.00040	.....	.....	
47,000	47,000	.00538	.00030	.....	.....	
48,000	48,000	.00574	.00036	.....	.....	
49,000	49,000	.00610	.00036	.....	.....	
50,000	50,000	.00640	.00030	.00410	.00154	
64,800	64,800	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure. Deflected upward at the middle.

No. 4864.

Marks, $\frac{12\ M\ R_{35}\ T\ R_2}{B\ T_{11}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000055	.000055	.....	.....	
3,000	3,000	.000105	.000050	.....	.....	
4,000	4,000	.000155	.000050	.....	.....	
5,000	5,000	.000210	.000055	0.	.....	
6,000	6,000	.000260	.000050	.....	.....	
7,000	7,000	.000320	.000060	.....	.....	
8,000	8,000	.000385	.000065	.....	.....	
9,000	9,000	.000450	.000065	.....	.....	
10,000	10,000	.000510	.000060	.000005	.000005	
11,000	11,000	.000570	.000060	.....	.....	
12,000	12,000	.000650	.000080	.000015	.000010	
13,000	13,000	.000735	.000085	.....	.....	
14,000	14,000	.000805	.000070	.000055	.000040	
15,000	15,000	.000895	.000090	.....	.....	
16,000	16,000	.001000	.000105	.000105	.000050	
17,000	17,000	.001100	.000100	.....	.....	
18,000	18,000	.001205	.000105	.000195	.000090	
19,000	19,000	.001350	.000145	.....	.....	
20,000	20,000	.001500	.000150	.000315	.000120	
21,000	21,000	.001675	.000175	.....	.....	
22,000	22,000	.001875	.000200	.000545	.000230	
23,400	23,000	.002150	.000275	.....	.....	
24,000	24,000	.002425	.000275	.000910	.000365	
25,000	25,000	.002815	.000390	.001205	.000295	
28,090	28,090	.....	.....	.....	.....	Tensile strength.

Fractured 5″ from neck. Appearance granular.

No. 4865.

Marks, $\frac{12\ M\ B_{11}\ T\ B_1}{M\ T_{11}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000200	.000050	0.	.....	
6,000	6,000	.000255	.000055	.....	.....	
7,000	7,000	.000305	.000050	.....	.....	
8,000	8,000	.000355	.000050	.....	.....	
9,000	9,000	.000405	.000050	.....	.....	
10,000	10,000	.000460	.000055	.000015	.000015	
11,000	11,000	.000530	.000070	.....	.....	
12,000	12,000	.000595	.000065	.000030	.000015	
13,000	13,000	.000650	.000055	.....	.....	
14,000	14,000	.000715	.000065	.000055	.000025	
15,000	15,000	.000795	.000080	.....	.....	
16,000	16,000	.000860	.000065	.000095	.000040	
17,000	17,000	.000950	.000090	.....	.....	
18,000	18,000	.001045	.000095	.000150	.000055	
19,000	19,000	.001140	.000095	.....	.....	
20,000	20,000	.001255	.000115	.000235	.000085	
21,000	21,000	.001390	.000135	.....	.....	
22,000	22,000	.001530	.000140	.000360	.000125	
23,000	23,000	.001695	.000165	.....	.....	
24,000	24,000	.001875	.000180	.000580	.000220	
25,000	25,000	.002125	.000250	.000745	.000165	
27,990	27,990	.....	.....	.....	.....	Tensile strength.

Fractured 11″ from neck. Appearance granular.

No. 1100.

Marks, $\frac{12\ M\ R_{28}\ T\ R_2}{B\ T_{12}}$.
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00010	.00006	.....	.....	
4,000	4,000	.00014	.00004	.....	.....	
5,000	5,000	.00020	.00006	0.	.....	
6,000	6,000	.00024	.00004	.....	.....	
7,000	7,000	.00030	.00006	.....	.....	
8,000	8,000	.00036	.00006	.....	.....	
9,000	9,000	.00042	.00006	.....	.....	
10,000	10,000	.00046	.00004	.00002	.00002	
11,000	11,000	.00054	.00008	.....	.....	
12,000	12,000	.00060	.00006	.....	.....	
13,000	13,000	.00066	.00006	.....	.....	
14,000	14,000	.00072	.00006	.....	.....	
15,000	15,000	.00078	.00006	.00006	.00004	
16,000	16,000	.00084	.00006	.....	.....	
17,000	17,000	.00092	.00008	.....	.....	
18,000	18,000	.00098	.00006	.....	.....	
19,000	19,000	.00106	.00008	.....	.....	
20,000	20,000	.00112	.00006	.00016	.00010	
21,000	21,000	.00118	.00006	.....	.....	
22,000	22,000	.00124	.00006	.....	.....	
23,000	23,000	.00132	.00008	.....	.....	
24,000	24,000	.00142	.00010	.....	.....	
25,000	25,000	.00152	.00010	.00026	.00010	
26,000	26,000	.00162	.00010	.....	.....	
27,000	27,000	.00174	.00012	.....	.....	
28,000	28,000	.00186	.00012	.....	.....	
29,000	29,000	.00198	.00012	.....	.....	
30,000	30,000	.00214	.00016	.00060	.00034	
31,000	31,000	.00234	.00020	.....	.....	
32,000	32,000	.00248	.00014	.....	.....	
33,000	33,000	.00268	.00020	.....	.....	
34,000	34,000	.00298	.00030	.....	.....	
35,000	35,000	.00320	.00022	.00142	.00082	
36,000	36,000	.00352	.00032	.....	.....	
37,000	37,000	.00380	.00028	.....	.....	
38,000	38,000	.00420	.00040	.....	.....	
39,000	39,000	.00462	.00042	.....	.....	
40,000	40,000	.00504	.00042	.00294	.00152	
41,000	41,000	.00558	.00054	.....	.....	
42,000	42,000	.00596	.00038	.....	.....	
43,000	43,000	.00644	.00048	.....	.....	
44,000	44,000	.00700	.00056	.....	.....	
45,000	45,000	.00746	.00046	.00506	.00212	
46,000	46,000	.00804	.00058	.....	.....	
47,000	47,000	.00850	.00046	.....	.....	
48,000	48,000	.00896	.00046	.....	.....	
49,000	49,000	.00942	.00046	.....	.....	
50,000	50,000	.00980	.00038	.00708	.00202	
60,900	60,900	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 1101.

Marks, $\frac{12\ M\ R_B\ T\ R_E}{B\ E_S}$)
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00010	.00006	.....	.....	
4,000	4,000	.00014	.00004	.....	.....	
5,000	5,000	.00020	.00006	0.	.....	
6,000	6,000	.00024	.00004	.....	.....	
7,000	7,000	.00030	.00006	.....	.....	
8,000	8,000	.00036	.00006	.....	.....	
9,000	9,000	.00042	.00006	.....	.....	
10,000	10,000	.00046	.00004	.00002	.00002	
11,000	11,000	.00052	.00006	.....	.....	
12,000	12,000	.00060	.00008	.....	.....	
13,000	13,000	.00066	.00006	.....	.....	
14,000	14,000	.00072	.00006	.....	.....	
15,000	15,000	.00078	.00006	.00006	.00004	
16,000	16,000	.00084	.00006	.....	.....	
17,000	17,000	.00090	.00006	.....	.....	
18,000	18,000	.00096	.00006	.....	.....	
19,000	19,000	.00102	.00006	.....	.....	
20,000	20,000	.00110	.00008	.00014	.00008	
21,000	21,000	.00118	.00008	.....	.....	
22,000	22,000	.00124	.00006	.....	.....	
23,000	23,000	.00136	.00012	.....	.....	
24,000	24,000	.00142	.00006	.....	.....	
25,000	25,000	.00150	.00008	.00026	.00012	
26,000	26,000	.00160	.00010	.....	.....	
27,000	27,000	.00176	.00016	.....	.....	
28,000	28,000	.00186	.00010	.....	.....	
29,000	29,000	.00196	.00010	.....	.....	
30,000	30,000	.00212	.00016	.00062	.00036	
31,000	31,000	.00232	.00020	.....	.....	
32,000	32,000	.00252	.00020	.....	.....	
33,000	33,000	.00270	.00018	.....	.....	
34,000	34,000	.00296	.00026	.....	.....	
35,000	35,000	.00324	.00028	.00042	.00080	
36,000	36,000	.00356	.00032	.....	.....	
37,000	37,000	.00396	.00040	.....	.....	
38,000	38,000	.00426	.00030	.....	.....	
39,000	39,000	.00476	.00050	.....	.....	
40,000	40,000	.00516	.00040	.00304	.00162	
41,000	41,000	.00566	.00050	.....	.....	
42,000	42,000	.00618	.00052	.....	.....	
43,000	43,000	.00670	.00052	.....	.....	
44,000	44,000	.00724	.00054	.....	.....	
45,000	45,000	.00776	.00052	.00532	.00228	
46,000	46,000	.00836	.00060	.....	.....	
47,000	47,000	.00896	.00060	.....	.....	
48,000	48,000	.00960	.00064	.....	.....	
49,000	49,000	.01036	.00076	.....	.....	
50,000	50,000	.01104	.00068	.00822	.00290	
61,680	61,680	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 1102.

Marks, $^{12\,M\,R_{II}\,T\,R_1}_{M\,T_{12}}$
Length, 10″.5.
Diameter, 1″.125.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006	.....	.....	
3,000	3,000	.00012	.00006	.....	.....	
4,000	4,000	.00016	.00004	.....	.....	
5,000	5,000	.00020	.00004	0.	.....	
6,000	6,000	.00024	.00004	.....	.....	
7,000	7,000	.00030	.00006	.....	.....	
8,000	8,000	.00036	.00006	.....	.....	
9,000	9,000	.00042	.00006	.....	.....	
10,000	10,000	.00046	.00004	.00004	.00004	
11,000	11,000	.00052	.00006	.....	.....	
12,000	12,000	.00058	.00006	.....	.....	
13,000	13,000	.00064	.00006	.....	.....	
14,000	14,000	.00068	.00004	.....	.....	
15,000	15,000	.00072	.00004	.00006	.00002	
16,000	16,000	.00080	.00008	.....	.....	
17,000	17,000	.00086	.00006	.....	.....	
18,000	18,000	.00094	.00008	.....	.....	
19,000	19,000	.00100	.00006	.....	.....	
20,000	20,000	.00104	.00004	.00014	.00008	
21,000	21,000	.00112	.00008	.....	.....	
22,000	22,000	.00118	.00006	.....	.....	
23,000	23,000	.00124	.00006	.....	.....	
24,000	24,000	.00134	.00010	.....	.....	
25,000	25,000	.00142	.00008	.00024	.00010	
26,000	26,000	.00150	.00008	.....	.....	
27,000	27,000	.00160	.00010	.....	.....	
28,000	28,000	.00172	.00012	.....	.....	
29,000	29,000	.00182	.00010	.....	.....	
30,000	30,000	.00196	.00014	.00052	.00028	
31,000	31,000	.00216	.00020	.....	.....	
32,000	32,000	.00230	.00014	.....	.....	
33,000	33,000	.00252	.00022	.....	.....	
34,000	34,000	.00278	.00026	.....	.....	
35,000	35,000	.00304	.00026	.00132	.00080	
36,000	36,000	.00352	.00048	.....	.....	
37,000	37,000	.00370	.00018	.....	.....	
38,000	38,000	.00412	.00042	.....	.....	
39,000	39,000	.00456	.00044	.....	.....	
40,000	40,000	.00496	.00040	.00294	.00162	
41,000	41,000	.00550	.00054	.....	.....	
42,000	42,000	.00600	.00050	.....	.....	
43,000	43,000	.00660	.00060	.....	.....	
44,000	44,000	.00710	.00050	.....	.....	
45,000	45,000	.00770	.00060	.00538	.00244	
46,000	46,000	.00838	.00068	.....	.....	
47,000	47,000	.00888	.00050	.....	.....	
48,000	48,000	.00960	.00072	.....	.....	
49,000	49,000	.01030	.00070	.....	.....	
50,000	50,000	.01084	.00054	.00820	.00282	
61,800	61,800	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 4874.

Marks, $\frac{^{12}MR_2\ TR_2}{BT_{11}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000055	.000055	.....	.....	
3,000	3,000	.000105	.000050	.....	.....	
4,000	4,000	.000160	.000055	.....	.....	
5,000	5,000	.000210	.000050	0.	.....	
6,000	6,000	.000280	.000070	.....	.....	
7,000	7,000	.000340	.000060	.....	.....	
8,000	8,000	.000410	.000070	.....	.....	
9,000	9,000	.000480	.000070	.....	.....	
10,000	10,000	.000550	.000070	.000035	.000035	
11,000	11,000	.000615	.000065	.....	.....	
12,000	12,000	.000700	.000085	.000070	.000070	
13,000	13,000	.000775	.000075	.....	.....	
14,000	14,000	.000855	.000080	.000100	.000030	
15,000	15,000	.000950	.000095	.....	.....	
16,000	16,000	.001055	.000105	.000150	.000050	
17,000	17,000	.001150	.000095	.....	.....	
18,000	18,000	.001275	.000125	.000225	.000075	
19,000	19,000	.001400	.000125	.....	.....	
20,000	20,000	.001550	.000150	.000360	.000134	
21,000	21,000	.001750	.000200	.....	.....	
22,000	22,000	.001950	.000200	.000575	.000215	
22,000	23,000	.002190	.000240	.....	.....	
24,000	24,000	.002450	.000260	.000920	.000345	
25,000	25,000	.002850	.000400	.001200	.000280	
27,460	27,460	.....	.....	.....	.....	Tensile strength.

Fractured 10″.5 from neck. Appearance granular, coarse spangles on one side.

No. 4875.

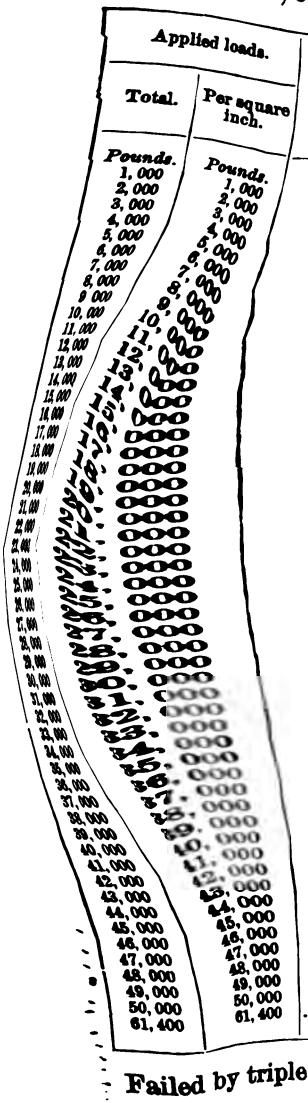
Marks, $\frac{^{12}\,MR_2\,TR_1}{MT_{11}}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000200	.000050	0.	.....	
6,000	6,000	.000255	.000055	.....	.....	
7,000	7,000	.000305	.000050	.....	.....	
8,000	8,000	.000355	.000050	.....	.....	
9,000	9,000	.000415	.000060	.....	.....	
10,000	10,000	.000480	.000065	.000015	.000015	
11,000	11,000	.000540	.000060	.....	.....	
12,000	12,000	.000600	.000060	.000040	.000025	
13,000	13,000	.000660	.000060	.....	.....	
14,000	14,000	.000745	.000085	.000065	.000025	
15,000	15,000	.000825	.000080	.....	.....	
16,000	16,000	.000900	.000075	.000105	.000040	
17,000	17,000	.000990	.000090	.....	.....	
18,000	18,000	.001075	.000085	.000160	.000055	
19,000	19,000	.001200	.000125	.....	.....	
20,000	20,000	.001300	.000100	.000250	.000090	
21,000	21,000	.001430	.000130	.....	.....	
22,000	22,000	.001575	.000145	.000395	.000145	
23,000	23,000	.001750	.000175	.....	.....	
24,000	24,000	.001950	.000200	.000610	.000215	
25,000	25,000	.002200	.000250	.000775	.000165	
26,500	26,500	.....	.....	.....	.....	Tensile strength.

Fractured 9″ from neck. Appearance granular, with coarse spangles.

No. 1103.

Marks, $^{12\,M\,R_2}_{B\,T_{12}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.



Applied loads. Total.	Applied loads. Per square inch.	Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
		0.	0.	0.	0.	Initial load.
1,000	1,000	.00006	.00006			
2,000	2,000	.00012	.00006			
3,000	3,000	.00018	.00006			
4,000	4,000	.00022	.00004	.00002	.00002	
5,000	5,000	.00028	.00006			
6,000	6,000	.00034	.00006			
7,000	7,000	.00040	.00006			
8,000	8,000	.00046	.00006			
9,000	9,000	.00052	.00006	.00006	.00004	
10,000	10,000	.00058	.00006			
11,000	11,000	.00064	.00006			
12,000	12,000	.00072	.00008			
13,000	13,000	.00078	.00006			
14,000	14,000	.00084	.00006	.00012	.00006	
15,000	15,000	.00092	.00008			
16,000	16,000	.00098	.00006			
17,000	17,000	.00106	.00008			
18,000	18,000	.00114	.00008			
19,000	19,000	.00120	.00006	.00022	.00010	
20,000	20,000	.00128	.00008			
21,000	21,000	.00136	.00008			
22,000	22,000	.00144	.00008			
23,000	23,000	.00154	.00010			
24,000	24,000	.00162	.00008	.00036	.00014	
25,000	25,000	.00172	.00010			
26,000	26,000	.00182	.00010			
27,000	27,000	.00196	.00014			
28,000	28,000	.00204	.00008			
29,000	29,000	.00220	.00016	.00062	.00026	
30,000	30,000	.00236	.00016			
31,000	31,000	.00256	.00020			
32,000	32,000	.00278	.00022			
33,000	33,000	.00296	.00018			
34,000	34,000	.00316	.00020	.00122	.00060	
35,000	35,000	.00356	.00040			
36,000	36,000	.00382	.00026			
37,000	37,000	.00428	.00046			
38,000	38,000	.00460	.00032			
39,000	39,000	.00522	.00062	.00306	.00184	
40,000	40,000	.00556	.00034			
41,000	41,000	.00606	.00050			
42,000	42,000	.00662	.00056			
43,000	43,000	.00712	.00050			
44,000	44,000	.00764	.00052	.00518	.00212	
45,000	45,000	.00838	.00074			
46,000	46,000	.00882	.00044			
47,000	47,000	.00930	.00048			
48,000	48,000	.01000	.00070			
49,000	49,000	.01090	.00090	.00786	.00268	
50,000	50,000					Ultimate strength.
61,400	61,400					

Failed by triple flexure.

No. 1104.

Marks, $^{12}\,\mathrm{M}\,\mathrm{R}_{28}\,\mathrm{T}\,\mathrm{R}_{2}$ / $\mathrm{B}\,\mathrm{R}_{29}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00010	.00006	.....	.....	
4,000	4,000	.00016	.00006	.....	.....	
5,000	5,000	.00020	.00004	0.	.....	
6,000	6,000	.00024	.00004	.....	.....	
7,000	7,000	.00032	.00008	.....	.....	
8,000	8,000	.00038	.00006	.....	.....	
9,000	9,000	.00042	.00004	.....	.....	
10,000	10,000	.00048	.00006	.00002	.00002	
11,000	11,000	.00054	.00006	.....	.....	
12,000	12,000	.00060	.00006	.....	.....	
13,000	13,000	.00068	.00008	.....	.....	
14,000	14,000	.00074	.00006	.....	.....	
15,000	15,000	.00078	.00004	.00006	.00004	
16,000	16,000	.00084	.00006	.....	.....	
17,000	17,000	.00090	.00006	.....	.....	
18,000	18,000	.00096	.00006	.....	.....	
19,000	19,000	.00102	.00006	.....	.....	
20,000	20,000	.00110	.00008	.00014	.00008	
21,000	21,000	.00118	.00008	.....	.....	
22,000	22,000	.00124	.00006	.....	.....	
23,000	23,000	.00132	.00008	.....	.....	
24,000	24,000	.00140	.00008	.....	.....	
25,000	25,000	.00148	.00008	.00024	.00010	
26,000	26,000	.00158	.00010	.....	.....	
27,000	27,000	.00168	.00010	.....	.....	
28,000	28,000	.00178	.00010	.....	.....	
29,000	29,000	.00188	.00010	.....	.....	
30,000	30,000	.00202	.00014	.00052	.00028	
31,000	31,000	.00218	.00016	.....	.....	
32,000	32,000	.00236	.00018	.....	.....	
33,000	33,000	.00252	.00016	.....	.....	
34,000	34,000	.00270	.00018	.....	.....	
35,000	35,000	.00296	.00026	.00118	.00066	
36,000	36,000	.00324	.00028	.....	.....	
37,000	37,000	.00354	.00030	.....	.....	
38,000	38,000	.00386	.00032	.....	.....	
39,000	39,000	.00420	.00034	.....	.....	
40,000	40,000	.00460	.00040	.00252	.00134	
41,000	41,000	.00506	.00046	.....	.....	
42,000	42,000	.00532	.00026	.....	.....	
43,000	43,000	.00574	.00042	.....	.....	
44,000	44,000	.00616	.00042	.....	.....	
45,000	45,000	.00660	.00044	.00426	.00174	
46,000	46,000	.00704	.00044	.....	.....	
47,000	47,000	.00740	.00036	.....	.....	
48,000	48,000	.00762	.00022	.....	.....	Deflects, convex on the micrometer side.
49,000	49,000	.00776	.00014	.....	.....	
50,000	50,000	.00782	.00006	.00538	.00112	
58,560	58,560	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 1105.

Marks, $\frac{12\ M\ R_2}{M\ T_{12}}\ \frac{T\ R_1}{}$.
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006	.....	.....	
3,000	3,000	.00012	.00006	.....	.....	
4,000	4,000	.00016	.00004	.....	.....	
5,000	5,000	.00020	.00004	0.	.....	
6,000	6,000	.00026	.00006	.....	.....	
7,000	7,000	.00032	.00006	.....	.....	
8,000	8,000	.00038	.00006	.....	.....	
9,000	9,000	.00042	.00004	.....	.....	
10,000	10,000	.00046	.00004	.00002	.00002	
11,000	11,000	.00054	.00008	.....	.....	
12,000	12,000	.00060	.00006	.....	.....	
13,000	13,000	.00066	.00006	.....	.....	
14,000	14,000	.00074	.00008	.....	.....	
15,000	15,000	.00078	.00004	.00006	.00004	
16,000	16,000	.00082	.00004	.....	.....	
17,000	17,000	.00090	.00008	.....	.....	
18,000	18,000	.00096	.00006	.....	.....	
19,000	19,000	.00102	.00006	.....	.....	
20,000	20,000	.00108	.00006	.00014	.00008	
21,000	21,000	.00116	.00008	.....	.....	
22,000	22,000	.00122	.00006	.....	.....	
23,000	23,000	.00130	.00008	.....	.....	
24,000	24,000	.00140	.00010	.....	.....	
25,000	25,000	.00148	.00008	.00024	.00010	
26,000	26,000	.00158	.00010	.....	.....	
27,000	27,000	.00168	.00010	.....	.....	
28,000	28,000	.00178	.00010	.....	.....	
29,000	29,000	.00192	.00014	.....	.....	
30,000	30,000	.00202	.00010	.00056	.00032	
31,000	31,000	.00220	.00018	.....	.....	
32,000	32,000	.00238	.00018	.....	.....	
33,000	33,000	.00258	.00020	.....	.....	
34,000	34,000	.00282	.00024	.....	.....	
35,000	35,000	.00312	.00030	.00136	.00080	
36,000	36,000	.00340	.00028	.....	.....	
37,000	37,000	.00368	.00028	.....	.....	
38,000	38,000	.00420	.00052	.....	.....	
39,000	39,000	.00456	.00036	.....	.....	
40,000	40,000	.00512	.00056	.00304	.00168	
41,000	41,000	.00576	.00064	.....	.....	
42,000	42,000	.00606	.00030	.....	.....	
43,000	43,000	.00652	.00046	.....	.....	
44,000	44,000	.00716	.00064	.....	.....	
45,000	45,000	.00772	.00056	.00536	.00232	
46,000	46,000	.00848	.00076	.....	.....	
47,000	47,000	.00890	.00042	.....	.....	
48,000	48,000	.00960	.00070	.....	.....	
49,000	49,000	.01024	.00064	.....	.....	
50,000	50,000	.01096	.00072	.00824	.00288	
59,200	59,200	.....	.....	.....	.....	Tensile strength.

Failed by triple flexure.

No. 4582.

Marks, $^{12}\,\mathrm{M}\,\mathrm{R}_2\,\mathrm{T}\,\mathrm{R}_2$ / $\mathrm{B}\,\mathrm{T}_1$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000200	.000050	0.	.....	
6,000	6,000	.000250	.000050	.....	.....	
7,000	7,000	.000300	.000050	.....	.....	
8,000	8,000	.000355	.000055	.....	.....	
9,000	9,000	.000410	.000055	.....	.....	
10,000	10,000	.000470	.000060	.000005	.000005	
11,000	11,000	.000540	.000070	.....	.....	
12,000	12,000	.000600	.000060	.000040	.000035	
13,000	13,000	.000665	.000065	.....	.....	
14,000	14,000	.000740	.000075	.000055	.000015	
15,000	15,000	.000820	.000080	.....	.....	
16,000	16,000	.000905	.000085	.000095	.000040	
17,000	17,000	.001000	.000095	.....	.....	
18,000	18,000	.001100	.000100	.000155	.000060	
19,000	19,000	.001200	.000100	.....	.....	
20,000	20,000	.001325	.000125	.000250	.000095	
21,000	21,000	.001460	.000135	.....	.....	
22,000	22,000	.001600	.000140	.000400	.000150	
23,000	23,000	.001800	.000200	.....	.....	
24,000	24,000	.002000	.000200	.000645	.000245	
25,000	25,000	.002300	.000300	.000850	.000205	
28,690	28,690	.....	.....	.....	.....	Tensile strength.

Fractured 4″ from neck. Appearance granular, with dark spangles.

No. 4883.

Marks, $^{12\ M\ R_W\ T\ R_1}_{M\ T_1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000200	.000050	0.	.....	
6,000	6,000	.000245	.000045	.....	.....	
7,000	7,000	.000295	.000050	.....	.....	
8,000	8,000	.000340	.000045	.....	.....	
9,000	9,000	.000390	.000050	.....	.....	
10,000	10,000	.000440	.000050	0.	.....	
11,000	11,000	.000495	.000055	.....	.....	
12,000	12,000	.000550	.000055	.000005	.000005	
13,000	13,000	.000610	.000060	.....	.....	
14,000	14,000	.000690	.000080	.000030	.000025	
15,000	15,000	.000750	.000060	.....	.....	
16,000	16,000	.000815	.000065	.000060	.000030	
17,000	17,000	.000900	.000085	.....	.....	
18,000	18,000	.001000	.000100	.000110	.000050	
19,000	19,000	.001090	.000090	.....	.....	
20,000	20,000	.001175	.000085	.000200	.000090	
21,000	21,000	.001300	.000125	.....	.....	
22,000	22,000	.001420	.000120	.000300	.000100	
23,000	23,000	.001560	.000140	.....	.....	
24,000	24,000	.001750	.000190	.000495	.000195	
25,000	25,000	.002000	.000250	.000650	.000155	
30,900	30,900	.....	.....	.....	.....	Tensile strength.

Fractured 11″ from neck. Appearance granular, mottled.

No. 1109.

Marks, $\frac{12\ M\ R_{II}\ T\ R_2}{B\ T_2}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00010	.00006	.....	.....	
4,000	4,000	.00014	.00004	.....	.....	
5,000	5,000	.00020	.00006	.00002	.00002	
6,000	6,000	.00024	.00004	.....	.....	
7,000	7,000	.00028	.00004	.....	.....	
8,000	8,000	.00036	.00008	.....	.....	
9,000	9,000	.00040	.00004	.....	.....	
10,000	10,000	.00046	.00006	.00006	.00004	
11,000	11,000	.00052	.00006	.....	.....	
12,000	12,000	.00058	.00006	.....	.....	
13,000	13,000	.00062	.00004	.....	.....	
14,000	14,000	.00072	.00010	.....	.....	
15,000	15,000	.00078	.00006	.00010	.00004	
16,000	16,000	.00082	.00004	.....	.....	
17,000	17,000	.00086	.00004	.....	.....	
18,000	18,000	.00094	.00008	.....	.....	
19,000	19,000	.00100	.00006	.....	.....	
20,000	20,000	.00106	.00006	.00018	.00008	
21,000	21,000	.00114	.00008	.....	.....	
22,000	22,000	.00122	.00008	.....	.....	
23,000	23,000	.00128	.00006	.....	.....	
24,000	24,000	.00138	.00010	.....	.....	
25,000	25,000	.00144	.00006	.00028	.00010	
26,000	26,000	.00156	.00012	.....	.....	
27,000	27,000	.00164	.00008	.....	.....	
28,000	28,000	.00178	.00014	.....	.....	
29,000	29,000	.00188	.00010	.....	.....	
30,000	30,000	.00204	.00016	.00060	.00032	
31,000	31,000	.00222	.00018	.....	.....	
32,000	32,000	.00238	.00016	.....	.....	
33,000	33,000	.00258	.00020	.....	.....	
34,000	34,000	.00282	.00024	.....	.....	
35,000	35,000	.00306	.00024	.00138	.00078	
36,000	36,000	.00346	.00040	.....	.....	
37,000	37,000	.00380	.00034	.....	.....	
38,000	38,000	.00418	.00038	.....	.....	
39,000	39,000	.00458	.00040	.....	.....	
40,000	40,000	.00500	.00042	.00302	.00164	
41,000	41,000	.00544	.00044	.....	.....	
42,000	42,000	.00586	.00042	.....	.....	
43,000	43,000	.00640	.00054	.....	.....	
44,000	44,000	.00686	.00046	.....	.....	
45,000	45,000	.00742	.00056	.00510	.00208	
46,000	46,000	.00786	.00044	.....	.....	
47,000	47,000	.00824	.00038	.....	.....	
48,000	48,000	.00876	.00052	.....	.....	
49,000	49,000	.00920	.00044	.....	.....	
50,000	50,000	.00964	.00044	.00710	.00200	
61,710	61,710	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 1110.

Marks, $^{12}\,\frac{M\,B_{27}\,T\,R_2}{B\,E_{10}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00008	.00004	.....	.....	
4,000	4,000	.00012	.00004	.....	.....	
5,000	5,000	.00018	.00006	.00002	.00002	
6,000	6,000	.00022	.00004	.....	.....	
7,000	7,000	.00026	.00004	.....	.....	
8,000	8,000	.00034	.00008	.....	.....	
9,000	9,000	.00038	.00004	.....	.....	
10,000	10,000	.00042	.00004	.00004	.00002	
11,000	11,000	.00048	.00006	.....	.....	
12,000	12,000	.00054	.00006	.....	.....	
13,000	13,000	.00060	.00006	.....	.....	
14,000	14,000	.00064	.00004	.....	.....	
15,000	15,000	.00070	.00006	.00006	.00002	
16,000	16,000	.00078	.00008	.....	.....	
17,000	17,000	.00082	.00004	.....	.....	
18,000	18,000	.00090	.00008	.....	.....	
19,000	19,000	.00096	.00006	.....	.....	
20,000	20,000	.00102	.00006	.00014	.00008	
21,000	21,000	.00108	.00006	.....	.....	
22,000	22,000	.00116	.00008	.....	.....	
23,000	23,000	.00122	.00006	.....	.....	
24,000	24,000	.00130	.00008	.....	.....	
25,000	25,000	.00138	.00008	.00022	.00008	
26,000	26,000	.00146	.00008	.....	.....	
27,000	27,000	.00158	.00012	.....	.....	
28,000	28,000	.00164	.00006	.....	.....	
29,000	29,000	.00180	.00016	.....	.....	
30,000	30,000	.00194	.00014	.00054	.00032	
31,000	31,000	.00210	.00016	.....	.....	
32,000	32,000	.00224	.00014	.....	.....	
33,000	33,000	.00250	.00026	.....	.....	
34,000	34,000	.00276	.00026	.....	.....	
35,000	35,000	.00302	.00026	.00136	.00082	
36,000	36,000	.00336	.00034	.....	.....	
37,000	37,000	.00370	.00034	.....	.....	
38,000	38,000	.00404	.00034	.....	.....	
39,000	39,000	.00446	.00042	.....	.....	
40,000	40,000	.00498	.00052	.00300	.00164	
41,000	41,000	.00540	.00042	.....	.....	
42,000	42,000	.00590	.00050	.....	.....	
43,000	43,000	.00640	.00050	.....	.....	
44,000	44,000	.00690	.00050	.....	.....	
45,000	45,000	.00744	.00054	.00518	.00218	
46,000	46,000	.00796	.00052	.....	.....	
47,000	47,000	.00836	.00040	.....	.....	
48,000	48,000	.00898	.00062	.....	.....	
49,000	49,000	.00938	.00040	.....	.....	
50,000	50,000	.00978	.00040	.00724	.00206	
60,790	60,790	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 1111.

Marks, $^{12\,M\,R_2}_{M\,T_2}{}^{T\,B_1}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00008	.00004	.....	.....	
4,000	4,000	.00014	.00006	.....	.....	
5,000	5,000	.00018	.00004	.00002	.00002	
6,000	6,000	.00022	.00004	.....	.....	
7,000	7,000	.00026	.00004	.....	.....	
8,000	8,000	.00034	.00008	.....	.....	
9,000	9,000	.00038	.00004	.....	.....	
10,000	10,000	.00042	.00004	.00004	.00002	
11,000	11,000	.00046	.00004	.....	.....	
12,000	12,000	.00054	.00008	.....	.....	
13,000	13,000	.00060	.00006	.....	.....	
14,000	14,000	.00064	.00004	.....	.....	
15,000	15,000	.00072	.00008	.00006	.00002	
16,000	16,000	.00076	.00004	.....	.....	
17,000	17,000	.00080	.00004	.....	.....	
18,000	18,000	.00086	.00006	.....	.....	
19,000	19,000	.00094	.00008	.....	.....	
20,000	20,000	.00100	.00006	.00010	.00004	
21,000	21,000	.00106	.00006	.....	.....	
22,000	22,000	.00114	.00008	.....	.....	
23,000	23,000	.00120	.00006	.....	.....	
24,000	24,000	.00124	.00004	.....	.....	
25,000	25,000	.00136	.00012	.00020	.00010	
26,000	26,000	.00142	.00006	.....	.....	
27,000	27,000	.00150	.00008	.....	.....	
28,000	28,000	.00160	.00010	.....	.....	
29,000	29,000	.00168	.00008	.....	.....	
30,000	30,000	.00180	.00012	.00042	.00022	
31,000	31,000	.00196	.00016	.....	.....	
32,000	32,000	.00210	.00014	.....	.....	
33,000	33,000	.00224	.00014	.....	.....	
34,000	34,000	.00246	.00022	.....	.....	
35,000	35,000	.00276	.00030	.00110	.00068	
36,000	36,000	.00302	.00026	.....	.....	
37,000	37,000	.00336	.00034	.....	.....	
38,000	38,000	.00370	.00034	.....	.....	
39,000	39,000	.00414	.00044	.....	.....	
40,000	40,000	.00460	.00046	.00264	.00154	
41,000	41,000	.00508	.00048	.....	.....	
42,000	42,000	.00556	.00048	.....	.....	
43,000	43,000	.00600	.00044	.....	.....	
44,000	44,000	.00656	.00056	.....	.....	
45,000	45,000	.00714	.00058	.00484	.00220	
46,000	46,000	.00762	.00048	.....	.....	
47,000	47,000	.00820	.00058	.....	.....	
48,000	48,000	.00870	.00050	.....	.....	
49,000	49,000	.00930	.00060	.....	.....	
50,000	50,000	.00990	.00060	.00734	.00250	
61,120	61,120	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 4899.

Marks, $\frac{12\ M\ B_{II}\ T\ R_2}{B\ T_1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000195	.000045	0.	.....	
6,000	6,000	.000250	.000055	.....	.....	
7,000	7,000	.000300	.000050	.....	.....	
8,000	8,000	.000350	.000050	.....	.....	
9,000	9,000	.000410	.000060	.....	.....	
10,000	10,000	.000485	.000075	.000010	.000010	
11,000	11,000	.000550	.000065	.....	.....	
12,000	12,000	.000610	.000060	.000045	.000035	
13,000	13,000	.000695	.000085	.....	.....	
14,000	14,000	.000760	.000065	.000060	.000015	
15,000	15,000	.000850	.000090	.....	.....	
16,000	16,000	.000945	.000095	.000110	.000050	
17,000	17,000	.001045	.000100	.....	.....	
18,000	18,000	.001145	.000100	.000185	.000075	
19,000	19,000	.001255	.000110	.....	.....	
20,000	20,000	.001400	.000145	.000295	.000110	
21,000	21,000	.001550	.000150	.....	.....	
22,000	22,000	.001745	.000195	.000490	.000195	
23,000	23,000	.001945	.000200	.....	.....	
24,000	24,000	.002175	.000230	.000765	.000275	
25,000	25,000	.002500	.000325	.001000	.000235	
29,220	29,220	.....	.....	.....	.....	Tensile strength.

Fractured 5″.7 from neck. Appearance granular.

No. 4900.

Marks, $\frac{12\,M\,R_2}{M\,T}\,T\,R_1$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000045	.000045	.....	.....	
3,000	3,000	.000090	.000045	.....	.....	
4,000	4,000	.000135	.000045	.....	.....	
5,000	5,000	.000180	.000045	0.	.....	
6,000	6,000	.000225	.000045	.....	.....	
7,000	7,000	.000280	.000055	.....	.....	
8,000	8,000	.000300	.000020	.....	.....	
9,000	9,000	.000360	.000060	.....	.....	
10,000	10,000	.000425	.000065	0.	.....	
11,000	11,000	.000490	.000065	.....	.....	
12,000	12,000	.000545	.000055	.000010	.000010	
13,000	13,000	.000600	.000055	.....	.....	
14,000	14,000	.000660	.000060	.000045	.000035	
15,000	15,000	.000735	.000075	.....	.....	
16,000	16,000	.000800	.000065	.000060	.000015	
17,000	17,000	.000865	.000065	.....	.....	
18,000	18,000	.000950	.000085	.000105	.000045	
19,000	19,000	.001035	.000085	.....	.....	
20,000	20,000	.001105	.000070	.000160	.000055	
21,000	21,000	.001210	.000105	.....	.....	
22,000	22,000	.001315	.000105	.000250	.000090	
23,000	23,000	.001450	.000135	.....	.....	
24,000	24,000	.001600	.000150	.000360	.000110	
25,000	25,000	.001760	.000160	.000490	.000130	
31,370	31,370	.....	.....	.....	.....	Tensile strength.

Fractured ″.75 from neck. Appearance granular.

No. 1112.

Marks, $\frac{12\,M\,R_2}{B\,T_2}\,T\,R_2$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00010	.00006	.....	.....	
4,000	4,000	.00014	.00004	.....	.....	
5,000	5,000	.00018	.00004	0.	.....	
6,000	6,000	.00022	.00004	.....	.....	
7,000	7,000	.00026	.00004	.....	.....	
8,000	8,000	.00030	.00004	.....	.....	
9,000	9,000	.00036	.00006	.....	.....	
10,000	10,000	.00042	.00006	.00004	.00004	
11,000	11,000	.00048	.00006	.....	.....	
12,000	12,000	.00054	.00006	.....	.....	
13,000	13,000	.00058	.00004	.....	.....	
14,000	14,000	.00064	.00006	.....	.....	
15,000	15,000	.00070	.00006	.00008	.00004	
16,000	16,000	.00076	.00006	.....	.....	
17,000	17,000	.00082	.00006	.....	.....	
18,000	18,000	.00088	.00006	.....	.....	
19,000	19,000	.00094	.00006	.....	.....	
20,000	20,000	.00100	.00006	.00012	.00004	
21,000	21,000	.00106	.00006	.....	.....	
22,000	22,000	.00114	.00008	.....	.....	
23,000	23,000	.00124	.00010	.....	.....	
24,000	24,000	.00128	.00004	.....	.....	
25,000	25,000	.00136	.00008	.00024	.00012	
26,000	26,000	.00146	.00010	.....	.....	
27,000	27,000	.00156	.00010	.....	.....	
28,000	28,000	.00166	.00010	.....	.....	
29,000	29,000	.00178	.00012	.....	.....	
30,000	30,000	.00190	.00012	.00052	.00028	
31,000	31,000	.00206	.00016	.....	.....	
32,000	32,000	.00222	.00016	.....	.....	
33,000	33,000	.00244	.00022	.....	.....	
34,000	34,000	.00266	.00022	.....	.....	
35,000	35,000	.00286	.00020	.00122	.00070	
36,000	36,000	.00320	.00034	.....	.....	
37,000	37,000	.00356	.00036	.....	.....	
38,000	38,000	.00390	.00034	.....	.....	
39,000	39,000	.00430	.00040	.....	.....	
40,000	40,000	.00474	.00044	.00280	.00152	
41,000	41,000	.00516	.00042	.....	.....	
42,000	42,000	.00556	.00040	.....	.....	
43,000	43,000	.00598	.00042	.....	.....	
44,000	44,000	.00642	.00044	.....	.....	
45,000	45,000	.00682	.00040	.00460	.00180	
46,000	46,000	.00726	.00044	.....	.....	
47,000	47,000	.00766	.00040	.....	.....	
48,000	48,000	.00804	.00038	.....	.....	
49,000	49,000	.00830	.00026	.....	.....	
50,000	50,000	.00850	.00020	.00606	.00146	
60,980	60,980	.....	.....	.....	.....	Ultimate strength.

Triple flexure. Deflected upward at middle.

No. 1113.

Marks, $\frac{12\ MR_2\ TR_2}{BR\ 10}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006	.....	.....	
3,000	3,000	.00010	.00004	.....	.....	
4,000	4,000	.00014	.00004	.....	.....	
5,000	5,000	.00018	.00004	0.	.....	
6,000	6,000	.00024	.00006	.....	.....	
7,000	7,000	.00030	.00006	.....	.....	
8,000	8,000	.00034	.00004	.....	.....	
9,000	9,000	.00040	.00006	.....	.....	
10,000	10,000	.00044	.00004	0.	.....	
11,000	11,000	.00050	.00006	.....	.....	
12,000	12,000	.00056	.00006	.....	.....	
13,000	13,000	.00062	.00006	.....	.....	
14,000	14,000	.00068	.00006	.....	.....	
15,000	15,000	.00074	.00006	.00006	.00006	
16,000	16,000	.00080	.00006	.....	.....	
17,000	17,000	.00084	.00004	.....	.....	
18,000	18,000	.00090	.00006	.....	.....	
19,000	19,000	.00098	.00008	.....	.....	
20,000	20,000	.00102	.00004	.00014	.00008	
21,000	21,000	.00112	.00010	.....	.....	
22,000	22,000	.00118	.00006	.....	.....	
23,000	23,000	.00124	.00006	.....	.....	
24,000	24,000	.00134	.00010	.....	.....	
25,000	25,000	.00142	.00008	.00024	.00010	
26,000	26,000	.00152	.00010	.....	.....	
27,000	27,000	.00160	.00008	.....	.....	
28,000	28,000	.00172	.00012	.....	.....	
29,000	29,000	.00184	.00012	.....	.....	
30,000	30,000	.00196	.00012	.00054	.00030	
31,000	31,000	.00214	.00018	.....	.....	
32,000	32,000	.00234	.00020	.....	.....	
33,000	33,000	.00256	.00022	.....	.....	
34,000	34,000	.00280	.00024	.....	.....	
35,000	35,000	.00306	.00026	.00132	.00078	
36,000	36,000	.00340	.00034	.....	.....	
37,000	37,000	.00374	.00034	.....	.....	
38,000	38,000	.00410	.00036	.....	.....	
39,000	39,000	.00450	.00040	.....	.....	
40,000	40,000	.00488	.00038	.00288	.00156	
41,000	41,000	.00536	.00048	.....	.....	
42,000	42,000	.00578	.00042	.....	.....	
43,000	43,000	.00620	.00042	.....	.....	
44,000	44,000	.00670	.00050	.....	.....	
45,000	45,000	.00712	.00042	.00484	.00196	
46,000	46,000	.00760	.00048	.....	.....	
47,000	47,000	.00794	.00034	.....	.....	
48,000	48,000	.00828	.00034	.....	.....	
49,000	49,000	.00856	.00028	.....	.....	
50,000	50,000	.00872	.00016	.00622	.00138	
60,350	60,350	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure. Deflected upward at the middle.

No. 1114.

Marks, $\frac{12\,M\,R}{M\,T}$, $\frac{T\,R}{2}$.
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006			
3,000	3,000	.00010	.00004			
4,000	4,000	.00014	.00004			
5,000	5,000	.00020	.00006	0.		
6,000	6,000	.00024	.00004			
7,000	7,000	.00030	.00006			
8,000	8,000	.00036	.00006			
9,000	9,000	.00040	.00004			
10,000	10,000	.00044	.00004	.00004	.00004	
11,000	11,000	.00050	.00006			
12,000	12,000	.00056	.00006			
13,000	13,000	.00060	.00004			
14,000	14,000	.00066	.00006			
15,000	15,000	.00070	.00004	.00010	.00006	
16,000	16,000	.00076	.00006			
17,000	17,000	.00080	.00004			
18,000	18,000	.00086	.00006			
19,000	19,000	.00092	.00006			
20,000	20,000	.00096	.00004	.00016	.00006	
21,000	21,000	.00102	.00006			
22,000	22,000	.00108	.00006			
23,000	23,000	.00114	.00006			
24,000	24,000	.00120	.00006			
25,000	25,000	.00126	.00006	.00022	.00006	
26,000	26,000	.00134	.00008			
27,000	27,000	.00140	.00006			
28,000	28,000	.00146	.00006			
29,000	29,000	.00154	.00008			
30,000	30,000	.00162	.00008	.00038	.00016	
31,000	31,000	.00170	.00008			
32,000	32,000	.00182	.00012			
33,000	33,000	.00194	.00012			
34,000	34,000	.00206	.00012			
35,000	35,000	.00220	.00014	.00066	.00028	
36,000	36,000	.00236	.00016			
37,000	37,000	.00256	.00020			
38,000	38,000	.00276	.00020			
39,000	39,000	.00304	.00028			
40,000	40,000	.00330	.00026	.00142	.00076	
41,000	41,000	.00360	.00030			
42,000	42,000	.00400	.00040			
43,000	43,000	.00440	.00040			
44,000	44,000	.00482	.00042			
45,000	45,000	.00518	.00036	.00302	.00160	
46,000	46,000	.00566	.00048			
47,000	47,000	.00616	.00050			
48,000	48,000	.00646	.00030			
49,000	49,000	.00698	.00052			
50,000	50,000	.00736	.00038	.00494	.00192	
64,480	64,480					Ultimate strength.

Failed by triple flexure. Deflected upward at the middle.

No. 4901.

Marks, $^{12}\,\mathrm{M}\,\mathrm{R}_{\mathrm{B}}\,\mathrm{T}\,\mathrm{R}_{\mathrm{T}_1}$

Diameter, 1″.129.

Sectional area, 1 square inch.

Length of stem, 23″.

Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000155	.000055	.....	.....	
5,000	5,000	.000205	.000050	0.	.....	
6,000	6,000	.000260	.000055	.....	.....	
7,000	7,000	.000320	.000060	.....	.....	
8,000	8,000	.000385	.000065	.....	.....	
9,000	9,000	.000450	.000065	.....	.....	
10,000	10,000	.000520	.000070	.000035	.000035	
11,000	11,000	.000590	.000070	.....	.....	
12,000	12,000	.000655	.000065	.000060	.000025	
13,000	13,000	.000740	.000085	.....	.....	
14,000	14,000	.000810	.000070	.000095	.000035	
15,000	15,000	.000905	.000095	.....	.....	
16,000	16,000	.001000	.000095	.000145	.000050	
17,000	17,000	.001100	.000100	.....	.....	
18,000	18,000	.001205	.000105	.000210	.000065	
19,000	19,000	.001340	.000135	.....	.....	
20,000	20,000	.001460	.000120	.000310	.000100	
21,000	21,000	.001645	.000185	.....	.....	
22,000	22,000	.001825	.000180	.000510	.000200	
23,000	23,000	.002050	.000225	.....	.....	
24,000	24,000	.002300	.000250	.000630	.000310	
24,810	24,810	.....	.....	.....	.....	Tensile strength.

Fractured 6″.8 from neck. Appearance granular, with coarse spangles on one side.

No. 4902.

Marks, $^{12}_{M}\,M\,R_2\,T\,R_1$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000045	.000045	.....	.....	
3,000	3,000	.000090	.000045	.....	.....	
4,000	4,000	.000135	.000045	.....	.....	
5,000	5,000	.000180	.000045	0.	.....	
6,000	6,000	.000225	.000045	.....	.....	
7,000	7,000	.000280	.000055	.....	.....	
8,000	8,000	.000330	.000050	.....	.....	
9,000	9,000	.000385	.000055	.....	.....	
10,000	10,000	.000440	.000055	.000005	.000005	
11,000	11,000	.000495	.000055	.....	.....	
12,000	12,000	.000555	.000060	.000015	.000010	
13,000	13,000	.000605	.000050	.....	.....	
14,000	14,000	.000660	.000055	.000050	.000035	
15,000	15,000	.000735	.000075	.....	.....	
16,000	16,000	.000800	.000065	.000060	.000010	
17,000	17,000	.000885	.000085	.....	.....	
18,000	18,000	.000950	.000065	.000100	.000040	
19,000	19,000	.001045	.000095	.....	.....	
20,000	20,000	.001125	.000080	.000150	.000050	
21,000	21,000	.001220	.000095	.....	.....	
22,000	22,000	.001325	.000105	.000215	.000065	
23,000	23,000	.001450	.000125	.....	.....	
24,000	24,000	.001595	.000145	.000350	.000135	
25,000	25,000	.001750	.000155	.000450	.000100	
32,010	32,010	.....	.....	.....	.....	Tensile strength.

Fractured 10″.9 from neck. Appearance granular, coarse on one side.

No. 1115.

Marks, $^{12\ M\ R_B\ T\ R_3}_{B\ T_3}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006	.....	.....	
3,000	3,000	.00012	.00006	.....	.....	
4,000	4,000	.00018	.00006	.....	.....	
5,000	5,000	.00022	.00004	.00002	.00002	
6,000	6,000	.00028	.00006	.....	.....	
7,000	7,000	.00034	.00006	.....	.....	
8,000	8,000	.00040	.00006	.....	.....	
9,000	9,000	.00044	.00004	.....	.....	
10,000	10,000	.00048	.00004	.00004	.00002	
11,000	11,000	.00054	.00006	.....	.....	
12,000	12,000	.00060	.00006	.....	.....	
13,000	13,000	.00066	.00006	.....	.....	
14,000	14,000	.00072	.00006	.....	.....	
15,000	15,000	.00076	.00004	.00008	.00004	
16,000	16,000	.00084	.00008	.....	.....	
17,000	17,000	.00092	.00008	.....	.....	
18,000	18,000	.00098	.00006	.....	.....	
19,000	19,000	.00104	.00006	.....	.....	
20,000	20,000	.00112	.00008	.00016	.00008	
21,000	21,000	.00120	.00008	.....	.....	
22,000	22,000	.00128	.00008	.....	.....	
23,000	23,000	.00134	.00006	.....	.....	
24,000	24,000	.00142	.00008	.....	.....	
25,000	25,000	.00150	.00008	.00028	.00012	
26,000	26,000	.00160	.00010	.....	.....	
27,000	27,000	.00170	.00010	.....	.....	
28,000	28,000	.00180	.00010	.....	.....	
29,000	29,000	.00192	.00012	.....	.....	
30,000	30,000	.00204	.00012	.00052	.00024	
31,000	31,000	.00216	.00012	.....	.....	
32,000	32,000	.00230	.00014	.....	.....	
33,000	33,000	.00248	.00018	.....	.....	
34,000	34,000	.00272	.00024	.....	.....	
35,000	35,000	.00294	.00022	.00114	.00062	
36,000	36,000	.00320	.00026	.....	.....	
37,000	37,000	.00350	.00030	.....	.....	
38,000	38,000	.00384	.00034	.....	.....	
39,000	39,000	.00424	.00040	.....	.....	
40,000	40,000	.00456	.00032	.00246	.00132	
41,000	41,000	.00500	.00044	.....	.....	
42,000	42,000	.00550	.00050	.....	.....	
43,000	43,000	.00600	.00050	.....	.....	
44,000	44,000	.00644	.00044	.....	.....	
45,000	45,000	.00690	.00046	.00450	.00204	
46,000	46,000	.00750	.00060	.....	.....	
47,000	47,000	.00800	.00050	.....	.....	
48,000	48,000	.00860	.00060	.....	.....	
49,000	49,000	.00930	.00070	.....	.....	
50,000	50,000	.00984	.00054	.00706	.00256	
63,210	63,210	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure. Deflected downward at the middle.

No. 1116.

Marks, $^{12\,M\,R_{29}\,T\,R_2}_{B\,R_{12}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00006	.00006			
3,000	3,000	.00010	.00004			
4,000	4,000	.00014	.00004			
5,000	5,000	.00020	.00006	0.	0.	
6,000	6,000	.00024	.00004			
7,000	7,000	.00030	.00006			
8,000	8,000	.00034	.00004			
9,000	9,000	.00040	.00006			
10,000	10,000	.00044	.00004	.00002	.00002	
11,000	11,000	.00050	.00006			
12,000	12,000	.00056	.00006			
13,000	13,000	.00062	.00006			
14,000	14,000	.00068	.00006			
15,000	15,000	.00074	.00006	.00006	.00004	
16,000	16,000	.00080	.00006			
17,000	17,000	.00084	.00004			
18,000	18,000	.00092	.00008			
19,000	19,000	.00098	.00006			
20,000	20,000	.00102	.00004	.00010	.00004	
21,000	21,000	.00108	.00006			
22,000	22,000	.00116	.00008			
23,000	23,000	.00122	.00006			
24,000	24,000	.00130	.00008			
25,000	25,000	.00136	.00006	.00020	.00010	
26,000	26,000	.00146	.00010			
27,000	27,000	.00156	.00010			
28,000	28,000	.00164	.00008			
29,000	29,000	.00174	.00010			
30,000	30,000	.00182	.00008	.00040	.00020	
31,000	31,000	.00198	.00016			
32,000	32,000	.00212	.00014			
33,000	33,000	.00224	.00012			
34,000	34,000	.00244	.00020			
35,000	35,000	.00264	.00020	.00094	.00054	
36,000	36,000	.00290	.00026			
37,000	37,000	.00314	.00024			
38,000	38,000	.00348	.00034			
39,000	39,000	.00380	.00032			
40,000	40,000	.00412	.00032	.00212	.00118	
41,000	41,000	.00454	.00042			
42,000	42,000	.00494	.00040			
43,000	43,000	.00536	.00042			
44,000	44,000	.00580	.00044			
45,000	45,000	.00619	.00030	.00394	.00182	
46,000	46,000	.00660	.00050			
47,000	47,000	.00702	.00042			
48,000	48,000	.00742	.00040			
49,000	49,000	.00778	.00036			
50,000	50,000	.00802	.00024	.00554	.00160	
61,800	61,800					Ultimate strength.

Failed by triple flexure. Deflected obliquely upward at the middle.

No. 1117.

Marks, $\frac{12\,M\,R_2\,T\,R_1}{M\,T_2}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00010	.00006	.....	.....	
4,000	4,000	.00014	.00004	.....	.....	
5,000	5,000	.00018	.00004	0.	0.	
6,000	6,000	.00022	.00004	.....	.....	
7,000	7,000	.00026	.00004	.....	.....	
8,000	8,000	.00030	.00004	.....	.....	
9,000	9,000	.00036	.00006	.....	.....	
10,000	10,000	.00040	.00004	.00002	.00002	
11,000	11,000	.00044	.00004	.....	.....	
12,000	12,000	.00050	.00006	.....	.....	
13,000	13,000	.00054	.00004	.....	.....	
14,000	14,000	.00060	.00006	.....	.....	
15,000	15,000	.00066	.00006	.00006	.00004	
16,000	16,000	.00072	.00006	.....	.....	
17,000	17,000	.00078	.00006	.....	.....	
18,000	18,000	.00082	.00004	.....	.....	
19,000	19,000	.00086	.00004	.....	.....	
20,000	20,000	.00092	.00006	.00010	.00004	
21,000	21,000	.00098	.00006	.....	.....	
22,000	22,000	.00104	.00006	.....	.....	
23,000	23,000	.00110	.00006	.....	.....	
24,000	24,000	.00116	.00006	.....	.....	
25,000	25,000	.00122	.00006	.00016	.00006	
26,000	26,000	.00132	.00010	.....	.....	
27,000	27,000	.00140	.00008	.....	.....	
28,000	28,000	.00144	.00004	.....	.....	
29,000	29,000	.00150	.00006	.....	.....	
30,000	30,000	.00158	.00008	.00028	.00012	
31,000	31,000	.00168	.00010	.....	.....	
32,000	32,000	.00176	.00008	.....	.....	
33,000	33,000	.00184	.00008	.....	.....	
34,000	34,000	.00196	.00012	.....	.....	
35,000	35,000	.00204	.00008	.00048	.00020	
36,000	36,000	.00220	.00016	.....	.....	
37,000	37,000	.00236	.00016	.....	.....	
38,000	38,000	.00256	.00020	.....	.....	
39,000	39,000	.00278	.00022	.....	.....	
40,000	40,000	.00300	.00022	.00114	.00066	
41,000	41,000	.00332	.00032	.....	.....	
42,000	42,000	.00364	.00032	.....	.....	
43,000	43,000	.00400	.00036	.....	.....	
44,000	44,000	.00444	.00044	.....	.....	
45,000	45,000	.00480	.00036	.00262	.00148	
46,000	46,000	.00524	.00044	.....	.....	
47,000	47,000	.00574	.00050	.....	.....	
48,000	48,000	.00624	.00050	.....	.....	
49,000	49,000	.00680	.00056	.....	.....	
50,000	50,000	.00732	.00052	.00482	.00220	
67,420	67,420	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure. Deflected downward at the middle.

No. 4915.

Marks, $^{12\ M\ R_2}_{B\ T}\ T\ R_2$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000200	.000050	0.	.....	
6,000	6,000	.000255	.000055	.....	.....	
7,000	7,000	.000305	.000050	.....	.....	
8,000	8,000	.000355	.000050	.....	.....	
9,000	9,000	.000405	.000050	.....	.....	
10,000	10,000	.000470	.000065	.000010	.000010	
11,000	11,000	.000540	.000070	.....	.....	
12,000	12,000	.000605	.000065	.000040	.000030	
13,000	13,000	.000665	.000060	.....	.....	
14,000	14,000	.000745	.000080	.000055	.000015	
15,000	15,000	.000805	.000060	.....	.....	
16,000	16,000	.000895	.000090	.000095	.000040	
17,000	17,000	.000965	.000070	.....	.....	
18,000	18,000	.001055	.000090	.000145	.000050	
19,000	19,000	.001150	.000095	.....	.....	
20,000	20,000	.001265	.000115	.000200	.000055	
21,000	21,000	.001400	.000135	.....	.....	
22,000	22,000	.001550	.000150	.000345	.000145	
23,000	23,000	.001705	.000155	.....	.....	
24,000	24,000	.001865	.000160	.000525	.000180	
25,000	25,000	.002105	.000240	.000675	.000150	
25,100	25,100	.....	.....	.....	.....	Tensile strength.

Fractured 6″.5 from neck. Appearance granular, with coarse spangles.

No. 4916.

Marks, $^{12\,M\,R_2\,T\,R_1}_{M\,T_1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000200	.000050	0.	.....	
6,000	6,000	.000250	.000050	.....	.....	
7,000	7,000	.000300	.000050	.....	.....	
8,000	8,000	.000355	.000055	.....	.....	
9,000	9,000	.000410	.000055	.....	.....	
10,000	10,000	.000475	.000065	.000010	.000010	
11,000	11,000	.000540	.000065	.....	.....	
12,000	12,000	.000600	.000060	.000040	.000030	
13,000	13,000	.000655	.000055	.....	.....	
14,000	14,000	.000725	.000070	.000050	.000050	
15,000	15,000	.000800	.000075	.....	.....	
16,000	16,000	.000885	.000085	.000080	.000030	
17,000	17,000	.000955	.000070	.....	.....	
18,000	18,000	.001050	.000095	.000110	.000030	
19,000	19,000	.001130	.000080	.....	.....	
20,000	20,000	.001245	.000115	.000190	.000080	
21,000	21,000	.001360	.000115	.....	.....	
22,000	22,000	.001475	.000115	.000290	.000100	
23,000	23,000	.001640	.000165	.....	.....	
24,000	24,000	.001800	.000160	.000445	.000155	
25,000	25,000	.002010	.000210	.000570	.000125	
27,040	27,040	.....	.....	.....	.....	Tensile strength.

Fractured 10″.6 from neck. Appearance granular with coarse spangles.

No. 1121.

Marks, $\frac{12\ M\ R_2}{B\ T_2}$ T R.
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00008	.00004	.....	.....	
4,000	4,000	.00014	.00006	.....	.....	
5,000	5,000	.00020	.00006	0.	.....	
6,000	6,000	.00024	.00004	.....	.....	
7,000	7,000	.00028	.00004	.....	.....	
8,000	8,000	.00034	.00006	.....	.....	
9,000	9,000	.00040	.00006	.....	.....	
10,000	10,000	.00044	.00004	0.	.....	
11,000	11,000	.00050	.00006	.....	.....	
12,000	12,000	.00056	.00006	.....	.....	
13,000	13,000	.00062	.00006	.....	.....	
14,000	14,000	.00070	.00008	.....	.....	
15,000	15,000	.00074	.00004	.00004	.00004	
16,000	16,000	.00080	.00006	.....	.....	
17,000	17,000	.00086	.00006	.....	.....	
18,000	18,000	.00094	.00008	.....	.....	
19,000	19,000	.00100	.00006	.....	.....	
20,000	20,000	.00106	.00006	.00010	.00006	
21,000	21,000	.00112	.00006	.....	.....	
22,000	22,000	.00120	.00008	.....	.....	
23,000	23,000	.00126	.00006	.....	.....	
24,000	24,000	.00134	.00008	.....	.....	
25,000	25,000	.00140	.00006	.00020	.00010	
26,000	26,000	.00148	.00008	.....	.....	
27,000	27,000	.00158	.00010	.....	.....	
28,000	28,000	.00170	.00012	.....	.....	
29,000	29,000	.00180	.00010	.....	.....	
30,000	30,000	.00188	.00008	.00040	.00020	
31,000	31,000	.00200	.00012	.....	.....	
32,000	32,000	.00218	.00018	.....	.....	
33,000	33,000	.00234	.00016	.....	.....	
34,000	34,000	.00252	.00018	.....	.....	
35,000	35,000	.00270	.00018	.00096	.00056	
36,000	36,000	.00294	.00024	.....	.....	
37,000	37,000	.00324	.00030	.....	.....	
38,000	38,000	.00358	.00034	.....	.....	
39,000	39,000	.00392	.00034	.....	.....	
40,000	40,000	.00426	.00034	.00222	.00126	
41,000	41,000	.00466	.00040	.....	.....	
42,000	42,000	.00508	.00042	.....	.....	
43,000	43,000	.00556	.00048	.....	.....	
44,000	44,000	.00604	.00048	.....	.....	
45,000	45,000	.00644	.00040	.00406	.00184	
46,000	46,000	.00690	.00046	.....	.....	
47,000	47,000	.00736	.00046	.....	.....	
48,000	48,000	.00776	.00040	.....	.....	
49,000	49,000	.00828	.00052	.....	.....	
50,000	50,000	.00870	.00042	.00660	.00194	
67,120	67,120	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure. Deflected obliquely upward.

No. 1122.

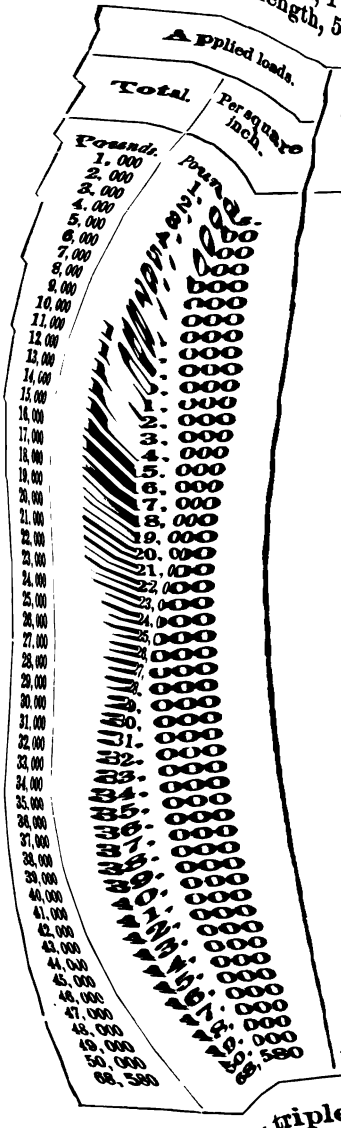
Marks, $\frac{12\ M\ R_{20}\ T\ R_2}{B\ R_{10}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00010	.00006	.....	.....	
4,000	4,000	.00016	.00006	.....	.....	
5,000	5,000	.00020	.00004	0.	.....	
6,000	6,000	.00024	.00004	.....	.....	
7,000	7,000	.00030	.00006	.....	.....	
8,000	8,000	.00036	.00006	.....	.....	
9,000	9,000	.00040	.00004	.....	.....	
10,000	10,000	.00044	.00004	.00002	.00002	
11,000	11,000	.00050	.00006	.....	.....	
12,000	12,000	.00056	.00006	.....	.....	
13,000	13,000	.00060	.00004	.....	.....	
14,000	14,000	.00064	.00004	.....	.....	
15,000	15,000	.00070	.00006	.00004	.00002	
16,000	16,000	.00076	.00006	.....	.....	
17,000	17,000	.00082	.00006	.....	.....	
18,000	18,000	.00090	.00008	.....	.....	
19,000	19,000	.00096	.00006	.....	.....	
20,000	20,000	.00102	.00006	.00008	.00004	
21,000	21,000	.00108	.00006	.....	.....	
22,000	22,000	.00116	.00008	.....	.....	
23,000	23,000	.00122	.00006	.....	.....	
24,000	24,000	.00128	.00006	.....	.....	
25,000	25,000	.00134	.00006	.00018	.00010	
26,000	26,000	.00142	.00008	.....	.....	
27,000	27,000	.00152	.00010	.....	.....	
28,000	28,000	.00160	.00008	.....	.....	
29,000	29,000	.00170	.00010	.....	.....	
30,000	30,000	.00180	.00010	.00038	.00020	
31,000	31,000	.00192	.00012	.....	.....	
32,000	32,000	.00204	.00012	.....	.....	
33,000	33,000	.00220	.00016	.....	.....	
34,000	34,000	.00242	.00022	.....	.....	
35,000	35,000	.00264	.00022	.00096	.00058	
36,000	36,000	.00292	.00028	.....	.....	
37,000	37,000	.00318	.00026	.....	.....	
38,000	38,000	.00350	.00032	.....	.....	
39,000	39,000	.00386	.00036	.....	.....	
40,000	40,000	.00422	.00036	.00224	.00128	
41,000	41,000	.00456	.00034	.....	.....	
42,000	42,000	.00516	.00060	.....	.....	
43,000	43,000	.00558	.00042	.....	.....	
44,000	44,000	.00604	.00046	.....	.....	
45,000	45,000	.00640	.00036	.00412	.00188	
46,000	46,000	.00700	.00060	.....	.....	
47,000	47,000	.00752	.00052	.....	.....	
48,000	48,000	.00810	.00058	.....	.....	
49,000	49,000	.00860	.00050	.....	.....	
50,000	50,000	.00920	.00060	.00648	.00236	
65,900	65,900	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure. Deflected downward.

No. 1123.

Marks, 12 M R T R 1
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.



Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Inch.	*Inch.*	*Inch.*	*Inch.*	
0.	0.	0.	0.	Initial load.
.00004	.00004	.....	.....	
.00008	.00004	.....	.....	
.00012	.00004	.....	.....	
.00016	.00004	0.	.....	
.00022	.00006	.....	.....	
.00026	.00004	.....	.....	
.00032	.00006	.....	.....	
.00038	.00006	.....	.....	
.00042	.00004	0.	.....	
.00046	.00004	.....	.....	
.00050	.00004	.....	.....	
.00054	.00004	.....	.....	
.00060	.00006	.....	.....	
.00064	.00004	.00002	.00002	
.00070	.00006	.....	.....	
.00078	.00008	.....	.....	
.00084	.00006	.....	.....	
.00090	.00006	.....	.....	
.00094	.00004	.00006	.00002	
.00100	.00006	.....	.....	
.00106	.00006	.....	.....	
.00112	.00006	.....	.....	
.00118	.00006	.....	.....	
.00124	.00006	.00010	.00004	
.00130	.00006	.....	.....	
.00136	.00006	.....	.....	
.00144	.00008	.....	.....	
.00152	.00008	.....	.....	
.00158	.00006	.00018	.00008	
.00168	.00010	.....	.....	
.00178	.00010	.....	.....	
.00186	.00008	.....	.....	
.00196	.00010	.....	.....	
.00214	.00018	.00046	.00028	
.00226	.00012	.....	.....	
.00240	.00014	.....	.....	
.00258	.00018	.....	.....	
.00280	.00022	.....	.....	
.00304	.00024	.00106	.00060	
.00336	.00034	.....	.....	
.00370	.00034	.....	.....	
.00394	.00024	.....	.....	
.00430	.00036	.....	.....	
.00464	.00034	.00238	.00132	
.00506	.00042	.....	.....	
.00556	.00050	.....	.....	
.00590	.00034	.....	.....	
.00638	.00048	.....	.....	
.00684	.00046	.00424	.00186	
.....	.....	.....	.....	Ultimate strength.

Failed by triple flexture. Deflected horizontally.

No. 4919.

Marks, $^{12\ M\ R_3\ T\ R_2}_{B\ T_1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000045	.000045	.....	.....	
3,000	3,000	.000095	.000050	.....	.....	
4,000	4,000	.000145	.000050	.....	.....	
5,000	5,000	.000190	.000045	0.	.....	
6,000	6,000	.000240	.000050	.....	.....	
7,000	7,000	.000285	.000045	.....	.....	
8,000	8,000	.000340	.000055	.....	.....	
9,000	9,000	.000390	.000050	.....	.....	
10,000	10,000	.000440	.000050	.000005	.000005	
11,000	11,000	.000490	.000050	.....	.....	
12,000	12,000	.000545	.000055	.000020	.000015	
13,000	13,000	.000600	.000055	.....	.....	
14,000	14,000	.000655	.000055	.000050	.000030	
15,000	15,000	.000730	.000075	.....	.....	
16,000	16,000	.000800	.000070	.000075	.000025	
17,000	17,000	.000880	.000080	.....	.....	
18,000	18,000	.000950	.000090	.000110	.000085	
19,000	19,000	.001040	.000090	.....	.....	
20,000	20,000	.001125	.000085	.000185	.000075	
21,000	21,000	.001240	.000115	.....	.....	
22,000	22,000	.001350	.000110	.000265	.000080	
23,000	23,000	.001490	.000140	.....	.....	
24,000	24,000	.001625	.000135	.000440	.000175	
25,000	25.000	.001850	.000225	.000590	.000150	
28,110	28,110	.....	.....	.....	.....	Tensile strength.

Fractured 5″.9 from neck. Appearance granular.

No. 4920.

Marks, $^{12\,M\,R_1}_{M\,T_1}{}^{T\,R_1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 23″.
Gauged length, 20″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000195	.000045	0.	.....	
6,000	6,000	.000245	.000050	.....	.....	
7,000	7,000	.000295	.000050	.....	.....	
8,000	8,000	.000345	.000050	.....	.....	
9,000	9,000	.000395	.000050	.....	.....	
10,000	10,000	.000445	.000050	.000010	.000010	
11,000	11,000	.000495	.000050	.....	.....	
12,000	12,000	.000550	.000055	.000030	.000020	
13,000	13,000	.000605	.000055	.....	.....	
14,000	14,000	.000665	.000060	.000050	.000020	
15,000	15,000	.000735	.000070	.....	.....	
16,000	16,000	.000800	.000065	.000070	.000020	
17,000	17,000	.000880	.000080	.....	.....	
18,000	18,000	.000945	.000065	.000100	.000030	
19,000	19,000	.001010	.000065	.....	.....	
20,000	20,000	.001105	.000095	.000150	.000050	
21,000	21,000	.001195	.000090	.....	.....	
22,000	22,000	.001300	.000105	.000240	.000090	
23,000	23,000	.001415	.000115	.....	.....	
24,000	24,000	.001550	.000135	.000350	.000110	
25,000	25,000	.001705	.000155	.000445	.000095	
32,200	32,200	.....	.....	.....	.....	Tensile strength.

Fractured 1″.7 from neck. Appearance granular.

No. 1124.

Marks, $\frac{12\,M\,R_2\,T\,R_2}{B\,T_2}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00010	.00006	.....	.....	
4,000	4,000	.00014	.00004	.....	.....	
5,000	5,000	.00018	.00004	0.	.....	
6,000	6,000	.00022	.00004	.....	.....	
7,000	7,000	.00026	.00004	.....	.....	
8,000	8,000	.00032	.00006	.....	.....	
9,000	9,000	.00038	.00006	.....	.....	
10,000	10,000	.00042	.00004	.00002	.00002	
11,000	11,000	.00048	.00006	.....	.....	
12,000	12,000	.00052	.00004	.....	.....	
13,000	13,000	.00056	.00004	.....	.....	
14,000	14,000	.00060	.00004	.....	.....	
15,000	15,000	.00066	.00006	.00004	.00002	
16,000	16,000	.00072	.00006	.....	.....	
17,000	17,000	.00078	.00006	.....	.....	
18,000	18,000	.00084	.00006	.....	.....	
19,000	19,000	.00092	.00008	.....	.....	
20,000	20,000	.00096	.00004	.00010	.00006	
21,000	21,000	.00102	.00006	.....	.....	
22,000	22,000	.00108	.00006	.....	.....	
23,000	23,000	.00114	.00006	.....	.....	
24,000	24,000	.00122	.00008	.....	.....	
25,000	25,000	.00128	.00006	.00018	.00008	
26,000	26,000	.00136	.00008	.....	.....	
27,000	27,000	.00144	.00008	.....	.....	
28,000	28,000	.00156	.00012	.....	.....	
29,000	29,000	.00166	.00010	.....	.....	
30,000	30,000	.00178	.00012	.00046	.00028	
31,000	31,000	.00194	.00016	.....	.....	
32,000	32,000	.00210	.00016	.....	.....	
33,000	33,000	.00224	.00014	.....	.....	
34,000	34,000	.00248	.00024	.....	.....	
35,000	35,000	.00274	.00026	.00114	.00068	
36,000	36,000	.00318	.00044	.....	.....	
37,000	37,000	.00352	.00034	.....	.....	
38,000	38,000	.00398	.00046	.....	.....	
39,000	39,000	.00436	.00038	.....	.....	
40,000	40,000	.00480	.00044	.00290	.00176	
41,000	41,000	.00520	.00040	.....	.....	
42,000	42,000	.00576	.00056	.....	.....	
43,000	43,000	.00624	.00048	.....	.....	
44,000	44,000	.00680	.00056	.....	.....	
45,000	45,000	.00732	.00052	.00510	.00220	
46,000	46,000	.00782	.00050	.....	.....	
47,000	47,000	.00840	.00058	.....	.....	
48,000	48,000	.00896	.00056	.....	.....	
49,000	49,000	.00960	.00064	.....	.....	
50,000	50,000	.01018	.00058	.00760	.00250	
65,680	65,680	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure. Deflected downward.

No. 1125.

Marks, $\frac{12\ M\ R_{28}\ T\ R_2}{B\ R_{10}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00012	.00008	.....	.....	
4,000	4,000	.00016	.00004	.....	.....	
5,000	5,000	.00018	.00002	0.	.....	
6,000	6,000	.00022	.00004	.....	.....	
7,000	7,000	.00028	.00006	.....	.....	
8,000	8,000	.00034	.00006	.....	.....	
9,000	9,000	.00038	.00004	.....	.....	
10,000	10,000	.00042	.00004	.00004	.00004	
11,000	11,000	.00046	.00004	.....	.....	
12,000	12,000	.00054	.00008	.....	.....	
13,000	13,000	.00058	.00004	.....	.....	
14,000	14,000	.00062	.00004	.....	.....	
15,000	15,000	.00068	.00006	.00006	.00002	
16,000	16,000	.00074	.00006	.....	.....	
17,000	17,000	.00080	.00006	.....	.....	
18,000	18,000	.00084	.00004	.....	.....	
19,000	19,000	.00090	.00006	.....	.....	
20,000	20,000	.00096	.00006	.00012	.00006	
21,000	21,000	.00102	.00006	.....	.....	
22,000	22,000	.00106	.00004	.....	.....	
23,000	23,000	.00112	.00006	.....	.....	
24,000	24,000	.00118	.00006	.....	.....	
25,000	25,000	.00124	.00006	.00020	.00008	
26,000	26,000	.00134	.00010	.....	.....	
27,000	27,000	.00142	.00008	.....	.....	
28,000	28,000	.00152	.00010	.....	.....	
29,000	29,000	.00160	.00008	.....	.....	
30,000	30,000	.00172	.00012	.00040	.00020	
31,000	31,000	.00184	.00012	.....	.....	
32,000	32,000	.00200	.00016	.....	.....	
33,000	33,000	.00218	.00018	.....	.....	
34,000	34,000	.00238	.00020	.....	.....	
35,000	35,000	.00262	.00024	.00104	.00064	
36,000	36,000	.00296	.00034	.....	.....	
37,000	37,000	.00324	.00028	.....	.....	
38,000	38,000	.00364	.00040	.....	.....	
39,000	39,000	.00414	.00050	.....	.....	
40,000	40,000	.00458	.00044	.00266	.00162	
41,000	41,000	.00506	.00048	.....	.....	
42,000	42,000	.00556	.00050	.....	.....	
43,000	43,000	.00608	.00052	.....	.....	
44,000	44,000	.00646	.00038	.....	.....	
45,000	45,000	.00700	.00054	.00484	.00218	
46,000	46,000	.00762	.00062	.....	.....	
47,000	47,000	.00800	.00038	.....	.....	
48,000	48,000	.00862	.00062	.....	.....	
49,000	49,000	.00930	.00068	.....	.....	
50,000	50,000	.01000	.00070	.00744	.00260	
61,400	61,400	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure. Deflected sidewise.

No. 1126.

Marks, $\frac{12\,M\,R_{T}\,T\,R_{1}}{M\,T_{2}}$
Length, 10″.5.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 5″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.00004	.00004	.....	.....	
3,000	3,000	.00008	.00004	.....	.....	
4,000	4,000	.00012	.00004	.....	.....	
5,000	5,000	.00016	.00006	0.	.....	
6,000	6,000	.00022	.00006	.....	.....	
7,000	7,000	.00026	.00004	.....	.....	
8,000	8,000	.00030	.00004	.....	.....	
9,000	9,000	.00034	.00004	.....	.....	
10,000	10,000	.00040	.00006	0.	.....	
11,000	11,000	.00046	.00006	.....	.....	
12,000	12,000	.00052	.00006	.....	.....	
13,000	13,000	.00056	.00004	.....	.....	
14,000	14,000	.00060	.00004	.....	.....	
15,000	15,000	.00064	.00004	.00002	.....	
16,000	16,000	.00070	.00006	.....	.....	
17,000	17,000	.00076	.00006	.....	.....	
18,000	18,000	.00080	.00004	.....	.....	
19,000	19,000	.00086	.00006	.....	.....	
20,000	20,000	.00092	.00006	.00006	.00004	
21,000	21,000	.00098	.00006	.....	.....	
22,000	22,000	.00104	.00006	.....	.....	
23,000	23,000	.00110	.00006	.....	.....	
24,000	24,000	.00116	.00006	.....	.....	
25,000	25,000	.00122	.00006	.00012	.00006	
26,000	26,000	.00128	.00006	.....	.....	
27,000	27,000	.00134	.00006	.....	.....	
28,000	28,000	.00140	.00006	.....	.....	
29,000	29,000	.00150	.00010	.....	.....	
30,000	30,000	.00158	.00108	.00022	.00010	
31,000	31,000	.00170	.00012	.....	.....	
32,000	32,000	.00180	.00010	.....	.....	
33,000	33,000	.00194	.00014	.....	.....	
34,000	34,000	.00208	.00014	.....	.....	
35,000	35,000	.00224	.00016	.00060	.00038	
36,000	36,000	.00246	.00022	.....	.....	
37,000	37,000	.00274	.00028	.....	.....	
38,000	38,000	.00300	.00026	.....	.....	
39,000	39,000	.00336	.00036	.....	.....	
40,000	40,000	.00368	.00032	.00178	.00118	
41,000	41,000	.00408	.00040	.....	.....	
42,000	42,000	.00440	.00032	.....	.....	
43,000	43,000	.00476	.00036	.....	.....	
44,000	44,000	.00520	.00044	.....	.....	
45,000	45,000	.00562	.00042	.00344	.00166	
46,000	46,000	.00604	.00042	.....	.....	
47,000	47,000	.00652	.00048	.....	.....	
48,000	48,000	.00700	.00048	.....	.....	
49,000	49,000	.00724	.00024	.....	.....	
50,000	50,000	.00770	.00046	.00524	.00180	
65,600	65,600	.....	.....	.....	.....	Ultimate strength.

Failed by triple flexure. Deflected upward.

12-INCH B. L. RIFLED MORTARS.

CHEMICAL COMPOSITION OF CAST-IRON BODIES.

Tension test number.	No. of body.	Mark on specimen.	Carbon.			Manganese.	Silicon.	Sulphur.	Phosphorus.	Copper.
			Total.	Graphitic.	Combined.					
4790	21	B T_{21}	2.858	2.053	0.305	0.348	1.034	0.040	0.392	0.010
4791	21	M T_{21}.....	2.339	2.143	0.296	0.337	1.034	0.050	0.407	0.010
4841	21	B T_{21}	2.645	2.217	0.428	0.409	0.968	0.080	0.371	0.009
4942	21	M T_{21}.....	2.645	2.098	0.547	0.400	0.940	0.079	0.193	0.010
4862	24	B T_{11}	2.222	2.083	0.141	0.389	1.004	0.095	0.326	0.010
4863	24	M T_{11}.....	2.375	2.077	0.145	0.406	0.911	0.095	0.358	0.008
4878	24	B T_1.....	2.541	1.728	0.813	0.420	0.780	0.094	0.678	0.006
4879	24	M T_1	2.454	1.873	0.581	0.400	0.703	0.098	0.807	0.005
4906	24	B T_1.....	2.836	1.644	1.192	0.466	1.260	0.080	0.220	0.008
4905	24	M T_1	3.152	1.987	1.165	0.477	0.940	0.092	0.201	0.004
4864	25	B T_{11}	2.713	2.110	0.603	0.433	0.789	0.082	0.405	0.010
4865	25	M T_{11}.....	2.727	2.179	0.548	0.411	0.789	0.085	0.391	0.010
4874	26	B T_{11}	2.641	2.004	0.637	0.413	1.184	0.104	0.301	0.008
4875	26	M T_{11}.....	2.658	2.571	0.087	0.396	1.259	0.115	0.319	0.006
4582	27	B T_1.....	2.665	2.127	0.538	0.411	0.940	0.110	0.316	0.010
4583	27	M T_1	2.631	2.257	0.374	0.406	0.987	0.105	0.347	0.012
4899	28	B T_1.....	2.566	2.181	0.385	0.409	0.827	0.082	0.374	0.008
4900	28	M T_1	2.833	2.039	0.794	0.411	0.902	0.075	0.326	0.006
4901	29	B T_1.....	2.656	2.435	0.221	0.411	1.004	0.098	0.301	0.005
4902	29	M T_1	2.596	2.380	0.216	0.417	1.222	0.108	0.293	0.008
4915	30	B T_1.....	2.615	1.737	0.878	0.426	1.250	0.102	0.419	0.000
4916	30	M T_1	2.236	1.666	0.570	0.435	1.222	0.098	0.342	0.000
4919	32	B T_1.....	2.427	1.832	0.595	0.413	1.120	0.064	0.257	0.000
4920	32	M T_1	2.418	1.835	0.583	0.417	1.101	0.067	0.244	0.000

12-INCH B. L. RIFLED MORTARS.

TABULATION OF TENSION SPECIMENS FROM CAST-IRON BODIES.

No. of test.	Number of—		Position in body.	Location of specimen.	Length of stem.	Sectional area.	Tensile strength per square inch.	Fracture.	Specific gravity.	Hardness.	Remarks.
	Mortar.	Specimen.									
					Inches.	*Sq. in.*	*Pounds.*				
4790	21	21	Breech	Inside	23	1.00	25,430	Granular			
4791	21	21	Muzzle	do	23	1.00	20,000	Granular, with coarse dark spangles			
319	21	23	Breech	do	Grooved	1.00	27,860	Granular	7.3374	15.75	
320	21	24	do	Outside	do	1.00	25,880	do	7.3360	14.90	
321	21	25	do	do	do	1.00	31,510	do	7.3405	16.07	
322	21	26	do	Inside	do	1.00	28,990	do			
323	21	27	do	do	do	1.00	28,150	do			
324	21	28	do	Outside	do	1.00	29,450	do			
325	21	29	do	do	do	1.00	28,110	do			
326	21	29	do	do	do	1.00	28,500	do			
327	21	29	do	do	do	1.00	29,270	do			
328	21	23	Muzzle	Inside	do	1.00	30,210	do	7.3053	15.67	
329	21	24	do	Outside	do	1.00	36,890	Fine granular	7.3327	16.47	
330	21	25	do	do	do	1.00	27,370	Granular	7.3340	15.67	
4841	21	31	Breech	Inside	23	1.00	25,410	Dark granular			
4842	21	31	Muzzle	do	23	1.00	25,970	do			
331	21	33	Breech	do	Grooved	1.00	29,100	Granular	7.2971	15.75	
332	21	34	do	Outside	do	1.00	30,040	do	7.2978	14.47	
333	21	35	do	do	do	1.00	31,020	do	7.2910	16.39	
334	21	36	do	Inside	do	1.00	29,850	do			
335	21	37	do	do	do	1.00	29,890	do			
336	21	38	do	Outside	do	1.00	30,310	do			
337	21	39	do	do	do	1.00	28,970	do			
338	21	33	Muzzle	Inside	do	1.00	29,880	do	7.2887	16.15	
339	21	34	do	Outside	do	1.00	32,420	do	7.2961	16.31	
340	21	35	do	do	do	1.00	33,260	do	7.2915	15.67	
4862	24	11	Breech	Inside	23	1.00	24,100	Granular, dark spangles			
4863	24	11	Muzzle	do	23	1.00	28,540	Granular			
341	24	13	Breech	do	Grooved	1.00	29,010	do	7.2896	13.99	
342	24	14	do	Outside	do	1.00	30,420	do	7.2945	15.91	
343	24	15	do	do	do	1.00	32,750	do	7.2946	16.07	
344	24	16	do	Inside	do	1.00	26,670	Granular, dark spangles			Heat 167.
345	24	17	do	do	do	1.00	27,900	do			
346	24	18	do	Outside	do	1.00	32,800	Granular			
347	24	19	do	do	do	1.00	32,510	do			
348	24	13	Muzzle	Inside	do	1.00	30,700	do	7.3001	14.98	
349	24	14	do	Outside	do	1.00	34,270	do	7.3084	16.39	
350	24	15	do	do	do	1.00	33,540	do	7.2855	14.90	

4878	24	1	Breech	Inside	23	1.00	30,420	Fine granular				
4879	24	1	Muzzle	do	23	1.00	29,600	do				
371	24	3	Breech	do	Grooved	1.00	35,380	do	7.3904	19.30		
372	24	4	do	Outside	do	1.00	37,550	do	7.3893	19.92		
373	24	5	do	do	do	1.00	34,980	do	7.3732	18.38		
374	24	6	do	Inside	do	1.00	37,700	do				Heat 170.
375	24	7	do	do	do	1.00	34,490	do				
376	24	8	do	Outside	do	1.00	34,510	do				
377	24	9	do	do	do	1.00	34,200	do				
378	24	3	Muzzle	Inside	do	1.00	32,900	Granular	7.3809	19.92		
379	24	4	do	Outside	do	1.00	30,480	do	7.3716	19.81		
380	24	5	do	do	do	1.00	33,020	do	7.3702	17.81		
4906	24	1	Breech	Inside	23	1.00	24,900	do				
4905	24	1	Muzzle	do	23	1.00	29,900	do				
411	24	3	Breech	do	Grooved	1.00	28,800	do	7.3846	17.08		
412	24	4	do	Outside	do	1.00	29,700	do	7.3359	16.99		
413	24	5	do	do	do	1.00	33,600	do	7.3289	16.99		
414	24	6	do	Inside	do	1.00	27,200	do				Heat 175.
415	24	7	do	do	do	1.00	29,800	do				
416	24	8	do	Outside	do	1.00	31,300	do				
417	24	9	do	do	do	1.00	30,800	do				
418	24	3	Muzzle	Inside	do	1.00	32,700	do	7.3454	17.73		
419	24	4	do	Outside	do	1.00	32,900	do	7.3425	17.99		
420	24	5	do	do	do	1.00	33,000	do	7.3355	17.26		
445	24	6	Breech	Inside	do	1.00	29,620	do			Heat 167.	Extra specimens.
446	24	7	do	do	do	1.00	29,630	do			Do.	
455	24	7	do	do	do	1.00	30,690	do			Do.	
456	24	7	do	do	do	1.00	31,950	do			Do.	
447	24	4	do	Outside	do	1.00	31,710	do			Heat 170.	
448	24	6	do	Inside	do	1.00	33,090	do			Do.	
451	24	3	do	do	do	1.00	28,360	do			Heat 175.	
453	24	3	do	do	do	1.00	28,290	do			Do.	
452	24	6	do	do	do	1.00	29,500	do			Do.	
454	24	6	do	do	do	1.00	30,600	do			Do.	
4864	25	11	do	do	23	1.00	28,090	do				
4865	25	11	Muzzle	do	23	1.00	27,990	do				
351	25	13	Breech	do	Grooved	1.00	28,200	do	7.3129	15.59		
352	25	14	do	Outside	do	1.00	31,810	do	7.3173	15.51		
353	25	15	do	do	do	1.00	31,670	do	7.3081	15.20		
354	25	16	do	Inside	do	1.00	30,500	do				
355	25	17	do	do	do	1.00	30,120	do				Heat 168.
356	25	18	do	Outside	do	1.00	32,030	do				
357	25	19	do	do	do	1.00	31,510	do				
358	25	13	Muzzle	Inside	do	1.00	28,900	do	7.3098	16.31		
359	25	14	do	Outside	do	1.00	32,320	do	7.3348	17.35		
360	25	15	do	do	do	1.00	32,270	do	7.3068	15.83		

Tabulation of tension specimens from cast-iron bodies—Continued.

No. of test.	Number of— Mortar.	Number of— Specimen.	Position in body.	Location of specimen.	Length of stem.	Sectional area.	Tensile strength per square inch.	Fracture.	Specific gravity.	Hardness.	Remarks.
					Inches.	*Sq. in.*	*Pounds.*				
4874	26	11	Breech....	Inside	23	1.00	27,460	Granular, coarse spangles on one side			
4875	26	11	Muzzle ...	.....do	23	1.00	26,500	Granular, with coarse spangles			
361	26	13	Breech....	Inside	Grooved ..	1.00	29,940	Granular	7.3191	16.64	
362	26	14	.....do	Outside...	.....do	1.00	30,650	.....do	7.3171	14.19	
363	26	15	.....do	.....do	.....do	1.00	34,670	Fine, granular	7.3148	16.73	
364	26	16	.....do	Inside	.....do	1.00	30,120	Granular			Heat 169.
365	26	17	.....do	.....do	.....do	1.00	31,200	.....do			
366	26	18	.....do	Outside...	.....do	1.00	30,340	.....do			
367	26	19	.....do	.....do	.....do	1.00	30,810	.....do			
368	26	13	Muzzle ...	Inside	.....do	1.00	31,300	.....do	7.3021	15.51	
369	26	14	.....do	Outside...	.....do	1.00	31,910	.....do	7.3107	16.73	
370	26	15	.....do	.....do	.....do	1.00	35,680	.....do	7.3109	16.73	
4582	27	1	Breech ...	Inside	23	1.00	28,690	Granular, with dark spangles			
4583	27	1	Muzzle	.....do	23	1.00	30,900	Granular, motled			
381	27	3	Breech....	.....do	Grooved ..	1.00	30,910	Granular	7.3321	16.56	
382	27	4	.....do	Outside...	.....do	1.00	33,190	.....do	7.3237	16.31	
383	27	5	.....do	.....do	.....do	1.00	34,380	.....do	7.3257	17.08	
384	27	6	.....do	Inside	.....do	1.00	32,510	.....do			Heat 171.
385	27	7	.....do	.....do	.....do	1.00	32,430	.....do			
386	27	8	.....do	Outside...	.....do	1.00	32,900	.....do			
387	27	9	.....do	.....do	.....do	1.00	29,920	.....do			
388	27	3	Muzzle ...	Inside	.....do	1.00	32,620	.....do	7.3311	16.99	
389	27	4	.....do	Outside...	.....do	1.00	32,230	.....do	7.3335	18.19	
390	27	5	.....do	.....do	.....do	1.00	34,620	.....do	7.3199	16.15	
4899	28	1	Breech ...	Inside	23	1.00	29,220	.....do			
4900	28	1	Muzzle	.....do	23	1.00	31,370	.....do			
391	28	3	Breech....	.....do	Grooved ..	1.00	36,320	.....do	7.3368	17.72	
392	28	4	.....do	Outside...	.....do	1.00	26,100	.....do	7.3346	17.72	
393	28	5	.....do	.....do	.....do	1.00	34,980	.....do	7.3283	17.44	
394	28	6	.....do	Inside	.....do	1.00	30,170	.....do			
395	28	7	.....do	.....do	.....do	1.00	32,750	.....do			
396	28	8	.....do	Outside...	.....do	1.00	30,320	.....do			Heat 172.
397	28	9	.....do	.....do	.....do	1.00	33,510	.....do			
398	28	3	Muzzle ...	Inside	.....do	1.00	37,080	.....do	7.3300	18.98	
399	28	4	.....do	Outside...	.....do	1.00	35,160	.....do	7.3286	18.78	
400	28	5	.....do	.....do	.....do	1.00	35,540	.....do	7.3187	17.08	
421	28	4	Breech ...	.....do	.....do	1.00	34,050	.....do	7.3376	17.26	Extra specimen.
422	28	4	.....do	.....do	.....do	1.00	32,800	.....do	7.3280	17.08	Do.
423	28	4	.....do	.....do	.....do	1.00	31,150	.....do	7.3263	17.35	Do.
424	28	4	.....do	.....do	.....do	1.00	33,300	.....do	7.3185	16.73	Do.

4901	29	1	.....do	Inside	23	1.00	24,810	Granular, with coarse spangles on one side.....	.....	.....	
4902	29	1	Muzzle ...	.....do	23	1.00	32,010	Granular, coarse on one side.....	.....	.....	
401	29	3	Breech ...	.....do	Grooved ..	1.00	30,070	Granular	7.3261	17.99	
402	29	4	.....do	Outside...	.....do	1.00	26,980	.....do	7.3218	17.73	
403	29	5	.....do	.....do	.....do	1.00	34,290	.....do	7.3289	17.53	
404	29	6	.....do	Inside	.....do	1.00	27,200	.....do	.....	.....	
405	29	7	.....do	.....do	.....do	1.00	29,980	.....do	.....	.....	Heat 174.
406	29	8	.....do	Outside...	.....do	1.00	32,410	.....do	.....	.....	
407	29	9	.....do	.....do	.....do	1.00	32,530	.....do	.....	.....	
408	29	3	Muzzle ...	Inside	.....do	1.00	33,710	.....do	7.3202	19.81	
409	29	4	.....do	Outside...	.....do	1.00	33,460	.....do	7.3336	19.08	
410	29	5	.....do	.....do	.....do	1.00	34,200	.....do	7.3301	17.78	
449	29	4	Breech ...	.....do	.....do	1.00	29,990	.....do	.....	.....	Extra specimen.
450	29	6	.....do	Inside	.....do	1.00	29,420	.....do	.....	.....	Do.
4915	30	1	.....do	.....do	23	1.00	25,100	Granular, with coarse spangles.....	.....	.....	
4916	30	1	Muzzle ...	.....do	23	1.00	27,040	.....do	.....	.....	
425	30	3	Breech ...	.....do	Grooved ..	1.00	30,290	Granular	7.3591	18.19	
426	30	4	.....do	Outside...	.....do	1.00	30,150	.....do	7.3598	18.68	
427	30	5	.....do	.... do	.....do	1.00	30,300	.....do	7.3473	18.38	
428	30	6	.....do	Inside	.....do	1.00	28,250	.....do	.....	.....	
429	30	7	.....do	.....do	.....do	1.00	30,620	.....do	.....	.....	Heat 177.
430	30	8	.....do	Outside...	.....do	1.00	30,590	.....do	.....	.....	
431	30	9	.....do	.....do	.....do	1.00	29,460	.....do	.....	.....	
432	30	3	Muzzle ...	Inside	.....do	1.00	29,080	.....do	7.3443	19.08	
433	30	4	.....do	Outside...	.....do	1.00	29,730	.....do	7.3437	18.68	
434	30	5	.....do	.....do	.....do	1.00	29,670	.....do	7.3424	19.08	
4919	32	1	Breech ...	Inside	23	1.00	28,110	.....do	.....	.....	
4920	32	1	Muzzle ...	.....do	23	1.00	32,200	.....do	.....	.....	
435	32	3	Breech ...	.....do	Grooved ..	1.00	32,990	.....do	7.3581	17.62	
436	32	4	.....do	Outside...	.....do	1.00	34,550	.....do	7.3348	17.72	
437	32	5	.....do	.....do	.....do	1.00	34,120	.....do	7.3374	17.26	
438	32	6	.....do	Inside	.....do	1.00	33,310	.....do	.....	.....	
439	32	7	.....do	.....do	.....do	1.00	34,620	.....do	.....	.....	Heat 179.
440	32	8	.....do	Outside...	.....do	1.00	33,350	.....do	.....	.....	
441	32	9	.....do	.....do	.....do	1.00	34,990	.....do	.....	.....	
442	32	3	Muzzle ...	Inside	.....do	1.00	34,130	.....do	7.3474	19.08	
443	32	4	.....do	Outside...	.....do	1.00	32,400	.....do	7.3533	19.08	
444	32	5	.....do	.....do	.....do	1.00	36,620	.....do	7.3478	17.72	

12-INCH B. L. RIFLED MORTARS.

TABULATION OF COMPRESSION SPECIMENS FROM CAST-IRON BODIES

No. of test.	Number of—		Position in body.	Location of specimen.	Total length.	Sectional area.	Ultimate strength per square inch.	Manner of failure.	Remarks.
	Mortar.	Specimen.							
					Inches.	*Sq. in.*	*Lbs.*		
1091	21	22	Breech..	Inside ..	10.5	1.00	57,060	Triple flexure..	
1092	21	30	....do ...	Radial ..	10.5	1.00	57,990	.....do	
1093	21	22	Muzzle .	Inside ..	10.5	1.00	56,970	.....do	
1094	21	32	Breech..	....do ...	10.5	1.00	57,780	.....do	
1095	21	40	....do ...	Radial ..	10.5	1.00	57,240	.....do	
1096	21	32	Muzzle .	Inside ..	10.5	1.00	58,910	.....do	
1097	24	12	Breech..	....do ...	10.5	1.00	60,380	... .do	Heat 167.
1098	24	20	....do ...	Radial ..	10.5	1.00	57,390	.....do	
1099	24	12	Muzzle .	Inside ..	10.5	1.00	58,300	.....do	
1106	24	2	Breech..	....do ...	10.5	1.00	68,680	.....do	Heat 170.
1107	24	10	....do ...	Radial ..	10.5	1.00	66,300	.....do	
1108	24	2	Muzzle .	Inside ..	10.5	1.00	69,380	.....do	
1118	24	2	Breech..	....do ...	10.5	1.00	59,800	.....do	Heat 175.
1119	24	10	....do ...	Radial ..	10.5	1.00	61,700	.....do	
1120	24	2	Muzzle .	Inside ..	10.5	1.00	64,800	.....do	
1100	25	12	Breech..	....do ...	10.5	1.00	60,900	.....do	Heat 168.
1101	25	20	....do ...	Radial ..	10.5	1.00	61,680	.....do	
1102	25	12	Muzzle .	Inside ..	10.5	1.00	61,800	.....do	
1103	26	12	Breech..	....do ...	10.5	1.00	61,460	.....do	Heat 169.
1104	26	20	....do ...	Radial ..	10.5	1.00	58,560	.....do	
1105	26	12	Muzzle .	Inside ..	10.5	1.00	59,200	.....do	
1109	27	2	Breech..	....do ...	10.5	1.00	61,710	.....do	Heat 171.
1110	27	10	....do ...	Radial ..	10.5	1.00	60,790	.....do	
1111	27	2	Muzzle .	Inside ..	10,5	1.00	61,120	.....do	
1112	28	2	Breech..	....do ...	10.5	1.00	60,980	.....do	Heat 172.
1113	28	10	....do ...	Radial ..	10.5	1.00	60,350	.....do	
1114	28	2	Muzzle .	Inside ..	10.5	1.00	64,480	.....do	
1115	29	2	Breech..	....do ...	10.5	1.00	63,210	.....do	Heat 174.
1116	29	10	....do ...	Radial ..	10.5	1.00	61,800	.....do	
1117	29	2	Muzzle .	Inside ..	10.5	1.00	67,420	.....do	
1121	30	2	Breech..	....do ...	10.5	1.00	67,130	.....do	Heat 177.
1122	30	10	....do ...	Radial ..	10.5	1.00	65,900	.....do	
1123	30	2	Muzzle .	Inside ..	10.5	1.00	68,580	.....do	
1124	32	2	Breech..	....do ...	10.5	1.00	65,680	.....do	Heat 179.
1125	32	10	....do ...	Radial ..	10.5	1.00	61,400	.....do	
1126	32	2	Muzzle .	Inside ..	10.5	1.00	65,600	.....do	

Diagrams showing chemical composition, tensile strength, specific gravity, and hardness of cast-iron bodies.

The full lines in the diagrams represent results obtained with the long tension specimens.

The mean results of the grooved tenacity specimens are plotted in dotted lines, rejecting from the averages and indicating on the diagram by dotted circles specimens which gave exceptionally high tensile strength.

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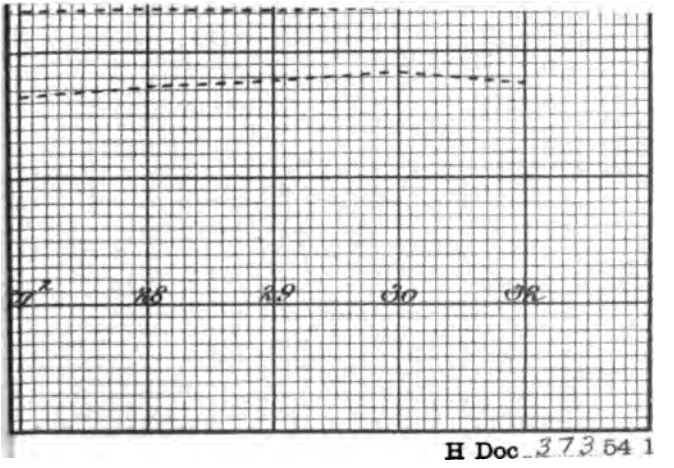


H Doc 373 54 1

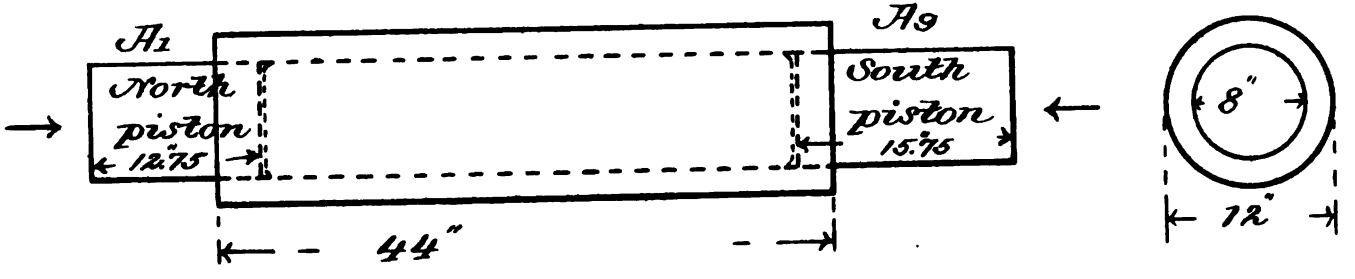
HYDROSTATIC TEST

OF

8-INCH TUBE SECTION.

8-inch Tube Section.

Arranged for interior hydrostatic pressure.



H Doc 373 54 1

HYDROSTATIC TEST OF 8-INCH TUBE SECTION.

These tests inaugurate a series of observations on the behavior of an 8-inch tube section when subjected to hydrostatic pressure acting singly either on the surface of the bore or on the exterior surface of the cylinder, or on both surfaces simultaneously, and furthermore accompanied by longitudinal stresses of tension or compression on the tube section.

In the present tests hydrostatic pressure was applied at the bore without longitudinally applied stresses, and measurements taken showing the expansion of exterior diameter and the concomitant contraction in length of tube.

Hydrostatic pressures were generated by means of pistons, which entered the ends of the tube and were directly loaded by compression loads on the testing machine.

The bore of the tube was charged with water and cup-shaped leather packings used on the inner ends of the pistons.

It was at first undertaken to measure a number of diameters on the tube section in two planes at right angles to each other, also the contraction of the tube over all, and along a number of sublengths, making these observations for each increment of interior pressure of 1,000 pounds per square inch.

In measurements of this kind it is necessary to compare the micrometer calipers employed, with reference bars at frequent intervals, to obtain corrections for changes in the temperatures of the micrometers, which affects their lengths.

It was found impracticable to maintain the reference bars at the mean temperature of the tube section; hence reliable temperature corrections were unattained.

Observations were, in consequence of this fact, confined to one diameter or gauged length at a time, and the diametrical expansion or longitudinal contraction determined for each successive pressure, completing a series of observations before there occurred a sensible change in either the temperature of the tube section or the temperature of the micrometer.

The expansion in exterior diameter was observed at the middle of the length of the tube, and the contraction in length on gauged lengths symmetrical with the ends.

Following the hydrostatic tests the pistons were removed, the water in the bore discharged, and the tube loaded by longitudinal compression, directly between the platforms of the testing machine.

In this position the longitudinal compressions and diametrical expansions were determined as before.

The ratio of longitudinal extension to lateral contraction in a plain steel bar of rectangular cross section was determined, using for this purpose one end of a steel eye bar which had previously been fractured by tension.

Advantage was taken of the opportunity to measure the extension of the diagonal of a square on the surface of the steel bar.

Tabulation of tension specimens from cast-iron bodies—Continued.

No. of test.	Number of— Mortar.	Number of— Specimen.	Position in body.	Location of specimen.	Length of stem.	Sectional area.	Tensile strength per square inch.	Fracture.	Specific gravity.	Hardness.	Remarks.
					Inches.	*Sq. in.*	*Pounds.*				
4874	26	11	Breech	Inside	23	1.00	27,460	Granular, coarse spangles on one side			
4875	26	11	Muzzle	do	23	1.00	26,500	Granular, with coarse spangles			
361	26	13	Breech	Inside	Grooved	1.00	29,940	Granular	7.3191	16.64	
362	26	14	do	Outside	do	1.00	30,650	do	7.3171	14.19	
363	26	15	do	do	do	1.00	34,670	Fine, granular	7.3148	16.73	
364	26	16	do	Inside	do	1.00	30,120	Granular			Heat 169.
365	26	17	do	do	do	1.00	31,200	do			
366	26	18	do	Outside	do	1.00	30,340	do			
367	26	19	do	do	do	1.00	30,810	do			
368	26	13	Muzzle	Inside	do	1.00	31,300	do	7.3021	15.51	
369	26	14	do	Outside	do	1.00	31,910	do	7.3107	16.73	
370	26	15	do	do	do	1.00	35,680	do	7.3109	16.73	
4582	27	1	Breech	Inside	23	1.00	28,690	Granular, with dark spangles			
4583	27	1	Muzzle	do	23	1.00	30,900	Granular, motled			
381	27	3	Breech	do	Grooved	1.00	30,910	Granular	7.3321	16.56	
382	27	4	do	Outside	do	1.00	33,190	do	7.3237	16.31	
383	27	5	do	do	do	1.00	34,380	do	7.3257	17.08	
384	27	6	do	Inside	do	1.00	32,510	do			Heat 171.
385	27	7	do	do	do	1.00	32,430	do			
386	27	8	do	Outside	do	1.00	32,900	do			
387	27	9	do	do	do	1.00	29,920	do			
388	27	3	Muzzle	Inside	do	1.00	32,620	do	7.3311	16.99	
389	27	4	do	Outside	do	1.00	32,330	do	7.3335	18.19	
390	27	5	do	do	do	1.00	34,620	do	7.3199	16.15	
4899	28	1	Breech	Inside	23	1.00	29,220	do			
4900	28	1	Muzzle	do	23	1.00	31,370	do			
391	28	3	Breech	do	Grooved	1.00	36,320	do	7.3368	17.72	
392	28	4	do	Outside	do	1.00	26,100	do	7.3346	17.72	
393	28	5	do	do	do	1.00	34,980	do	7.3283	17.44	
394	28	6	do	Inside	do	1.00	30,170	do			
395	28	7	do	do	do	1.00	32,750	do			
396	28	8	do	Outside	do	1.00	30,320	do			Heat 172.
397	28	9	do	do	do	1.00	33,510	do			
398	28	3	Muzzle	Inside	do	1.00	37,080	do	7.3300	18.88	
399	28	4	do	Outside	do	1.00	35,160	do	7.3286	18.78	
400	28	5	do	do	do	1.00	35,540	do	7.3187	17.08	
421	28	4	Breech	do	do	1.00	34,050	do	7.3376	17.26	Extra specimen.
422	28	4	do	do	do	1.00	32,800	do	7.3280	17.08	Do.
423	28	4	do	do	do	1.00	31,150	do	7.3263	17.35	Do.
424	28	4	do	do	do	1.00	33,300	do	7.3185	16.73	Do.

4901	29	1	.....do	Inside	23	1.00	24,810	Granular, with coarse spangles on one side.....	.....	.....	
4902	29	1	Muzzle ...	.....do	23	1.00	32,010	Granular, coarse on one side.....	.....	.....	
401	29	3	Breech ...	.....do	Grooved ..	1.00	30,070	Granular	7.3261	17.99	
402	29	4	.....do	Outside...	.....do	1.00	26,980	.....do	7.3218	17.73	
403	29	5	.....do	.....do	.....do	1.00	34,290	.....do	7.3289	17.53	
404	29	6	.....do	Inside	.....do	1.00	27,200	.....do	.....	.....	
405	29	7	.....do	.....do	.....do	1.00	29,980	.....do	.....	.....	Heat 174.
406	29	8	.....do	Outside...	.....do	1.00	32,410	.....do	.....	.....	
407	29	9	.....do	.....do	.....do	1.00	32,530	.....do	.....	.....	
408	29	3	Muzzle ...	Inside	.....do	1.00	33,710	.....do	7.3202	19.81	
409	29	4	.....do	Outside...	.....do	1.00	33,460	.....do	7.3336	19.08	
410	29	5	.....do	.....do	.....do	1.00	34,200	.....do	7.3301	17.78	
449	29	4	Breech ...	.....do	.....do	1.00	29,990	.....do	.....	.....	Extra specimen.
450	29	6	.....do	Inside	.....do	1.00	29,420	.....do	.....	.....	Do.
4915	30	1	.....do	.....do	23	1.00	25,100	Granular, with coarse spangles.....	.....	.....	
4916	30	1	Muzzle ...	.....do	23	1.00	27,040	.....do	.....	.....	
425	30	3	Breech ...	.....do	Grooved ..	1.00	30,290	Granular	7.3591	18.19	
426	30	4	.....do	Outside...	.....do	1.00	30,150	.....do	7.3598	18.68	
427	30	5	.....do	.... do	.....do	1.00	30,300	.....do	7.3473	18.38	
428	30	6	.....do	Inside	.....do	1.00	28,250	.....do	.....	.....	
429	30	7	.....do	.....do	.....do	1.00	30,620	.....do	.....	.....	Heat 177.
430	30	8	.....do	Outside...	.....do	1.00	30,590	.....do	.....	.....	
431	30	9	.....do	.....do	.....do	1.00	29,460	.....do	.....	.....	
432	30	3	Muzzle ...	Inside	.....do	1.00	29,080	.....do	7.3443	19.08	
433	30	4	.....do	Outside...	.....do	1.00	29,730	.....do	7.3437	18.68	
434	30	5	.....do	.....do	.....do	1.00	29,670	.....do	7.3424	19.08	
4919	32	1	Breech ...	Inside	23	1.00	28,110	.....do	.....	.....	
4920	32	1	Muzzle ...	.....do	23	1.00	32,200	.....do	.....	.....	
435	32	3	Breech ...	.....do	Grooved ..	1.00	32,990	.....do	7.3581	17.62	
436	32	4	.....do	Outside...	.....do	1.00	34,550	.....do	7.3348	17.72	
437	32	5	.....do	.....do	.....do	1.00	34,120	.....do	7.3374	17.20	
438	32	6	.....do	Inside	.....do	1.00	33,310	.....do	.....	.....	
439	32	7	.....do	.....do	.....do	1.00	34,620	.....do	.....	.....	Heat 179.
440	32	8	.....do	Outside...	.....do	1.00	33,350	.....do	.....	.....	
441	32	9	.....do	.....do	.....do	1.00	34,990	.....do	.....	.....	
442	32	3	Muzzle ...	Inside	.....do	1.00	34,130	.....do	7.3474	19.08	
443	32	4	.....do	Outside...	.....do	1.00	32,400	.....do	7.3533	19.08	
444	32	5	.....do	.....do	.....do	1.00	36,620	.....do	7.3478	17.72	

12-INCH B. L. RIFLED MORTARS.

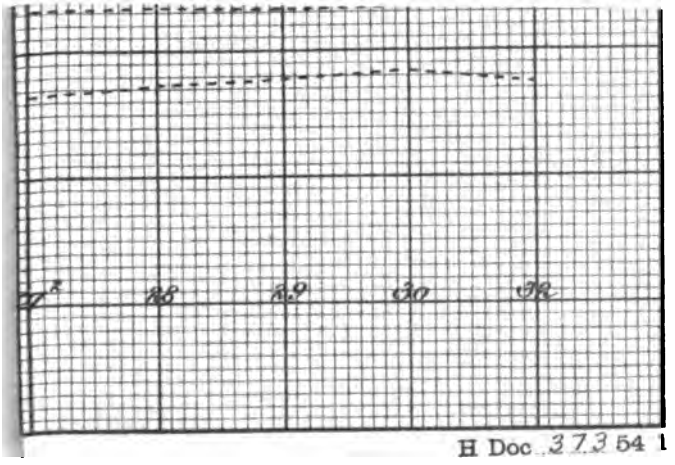
TABULATION OF COMPRESSION SPECIMENS FROM CAST-IRON BODIES

No. of test.	Number of—		Position in body.	Location of specimen.	Total length.	Sectional area.	Ultimate strength per square inch.	Manner of failure.	Remarks.
	Mortar.	Specimen.							
					Inches.	*Sq. in.*	*Lbs.*		
1091	21	22	Breech..	Inside ..	10.5	1.00	57,060	Triple flexure..	
1092	21	30	....do ...	Radial ..	10.5	1.00	57,990	.....do	
1093	21	22	Muzzle .	Inside ..	10.5	1.00	56,970	.....do	
1094	21	32	Breech..	....do ...	10.5	1.00	57,780	.....do	
1095	21	40	....do ...	Radial ..	10.5	1.00	57,240	.....do	
1096	21	32	Muzzle .	Inside ..	10.5	1.00	58,910	.....do	
1097	24	12	Breech..	....do ...	10.5	1.00	60,380	... .do	Heat 167.
1098	24	20	....do ...	Radial ..	10.5	1.00	57,390	.....do	
1099	24	12	Muzzle .	Inside ..	10.5	1.00	58,300	.....do	
1106	24	2	Breech..	....do ...	10.5	1.00	68,680	.....do	Heat 170.
1107	24	10	....do ...	Radial ..	10.5	1.00	66,300	.....do	
1108	24	2	Muzzle .	Inside ..	10.5	1.00	69,380	.....do	
1118	24	2	Breech..	....do ...	10.5	1.00	59,800	.....do	Heat 175.
1119	24	10	....do ...	Radial ..	10.5	1.00	61,700	.....do	
1120	24	2	Muzzle .	Inside ..	10.5	1.00	64,800	.....do	
1100	25	12	Breech..	....do ...	10.5	1.00	60,900	.....do	Heat 168.
1101	25	20	....do ...	Radial ..	10.5	1.00	61,680	.....do	
1102	25	12	Muzzle .	Inside ..	10.5	1.00	61,800	.....do	
1103	26	12	Breech..	....do ...	10.5	1.00	61,460	.....do	Heat 169.
1104	26	20	....do ...	Radial ..	10.5	1.00	58,560	.....do	
1105	26	12	Muzzle .	Inside ..	10.5	1.00	59,200	.....do	
1109	27	2	Breech..	....do ...	10.5	1.00	61,710	.....do	Heat 171.
1110	27	10	....do ...	Radial ..	10.5	1.00	60,790	.....do	
1111	27	2	Muzzle .	Inside ..	10,5	1.00	61,120	.....do	
1112	28	2	Breech..	....do ...	10.5	1.00	60,980	.....do	Heat 172.
1113	28	10	....do ...	Radial ..	10.5	1.00	60,350	.....do	
1114	28	2	Muzzle .	Inside ..	10.5	1.00	64,480	.....do	
1115	29	2	Breech..	....do ...	10.5	1.00	63,210	.....do	Heat 174.
1116	29	10	....do ...	Radial ..	10.5	1.00	61,800	.....do	
1117	29	2	Muzzle .	Inside ..	10.5	1.00	67,420	.....do	
1121	30	2	Breech..	....do ...	10.5	1.00	67,130	.....do	Heat 177.
1122	30	10	....do ...	Radial ..	10.5	1.00	65,900	.....do	
1123	30	2	Muzzle .	Inside ..	10.5	1.00	68,580	.....do	
1124	32	2	Breech..	....do ...	10.5	1.00	65,680	.....do	Heat 179.
1125	32	10	....do ...	Radial ..	10.5	1.00	61,400	.....do	
1126	32	2	Muzzle .	Inside ..	10.5	1.00	65,600	.....do	

Diagrams showing chemical composition, tensile strength, specific gravity, and hardness of cast-iron bodies.

The full lines in the diagrams represent results obtained with the long tension specimens.

The mean results of the grooved tenacity specimens are plotted in dotted lines, rejecting from the averages and indicating on the diagram by dotted circles specimens which gave exceptionally high tensile strength.


H Doc 373 54

HYDROSTATIC TEST

OF

8-INCH TUBE SECTION.

LATERAL CONTRACTION MEASURED IN THREE PLACES, AT EACH END OF THE 40″ GAUGED LENGTH, AND AT THE MIDDLE OF THE GAUGED LENGTH, DESIGNATED AS LENGTHS A, B, AND C.

B is the middle one on the bar.
Each transverse gauged length, 8″ long.

ON GAUGED LENGTH A.

Applied loads.		In gauged length.			Remarks.
Total.	Per square inch.	Lateral contraction.	Successive contraction.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
8,008	1,000	0.	0.	.....	Initial load.
40,040	5,000	.0003	.0003	.....	
80,080	10,000	.0007	.0004	.....	
160,160	20,000	.0014	.0007	.....	
240,240	30,000	.0022	.0008	.....	
320,320	40,000	.0030	.0008	.....	
240,240	30,000	.0022	.0008	.....	
160,160	20,000	.0014	.0007	.....	
80,080	10,000	.0007	.0007	.....	
40,040	5,000	.0003	.0004	.....	
8,008	1,000	0.	.0003	.....	
320,320	40,000	.0029	.0029	.....	
8,008	1,000	0.	.0029	.....	
320,320	40,000	.0029	.0029	.....	
8,008	1,000	0.	.0029	.....	

ON GAUGED LENGTH B.

8,008	1,000	0.	.....	.....	Initial load.
320,320	40,000	.0030	.0030	.....	
8,008	1,000	0.	.0030	.....	
320,320	40,000	.0030	.0030	.....	
8,008	1,000	0.	.0030	.....	

ON GAUGED LENGTH C.

8,008	1,000	0.	.....	.....	Initial load.
320,320	40,000	.0031—	.0031	.....	
8,008	1,000	.0001	.0030	.....	
320,320	40,000	.0031	.0030	.....	
8,008	1,000	.0001	.0030	.....	

MEASUREMENTS TAKEN ALONG THE DIAGONALS OF A SQUARE 8″ ON A SIDE, TWO SIDES OF THE SQUARE BEING PARALLEL AND PERPENDICULAR, RESPECTIVELY, TO THE AXIS OF THE EYE BAR.

This 8″ square is at end A of the 40″ gauged length.
Gauged length, 11″.3137.

FIRST DIAGONAL.

Applied loads.		In gauged length.			Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
8,008	1,000	0.	0.	0.	Initial load.
320,320	40,000	.0053	.0053	.....	
8,008	1,000	0.	.0053	.....	
320,320	40,000	.0054	.0054	.....	
8,008	1,000	0.	.0054	.....	
320,320	40,000	.0054	.0054	.....	
8,008	1,000	0.	.0054	.....	

SECOND DIAGONAL.

8,008	1,000	0.	0.	0.	Initial load.
320,320	40,000	.0051	.0051	.....	
8,008	1,000	0.	.0051	.....	
320,320	40,000	.0051+	.0051	.....	
8,008	1,000	0.	.0051	.....	
320,320	40,000	.0051	.0051	.....	
8,008	1,000	0.	.0051	.....	

MEASUREMENTS TAKEN ALONG THE DIAGONALS OF ANOTHER 8″ SQUARE LOCATED AT END C OF THE 40″ GAUGED LENGTH.

FIRST DIAGONAL.

Applied loads.		In gauged length.			Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
8,008	1,000	0.	0.	.....	Initial load.
320,320	40,000	.0054+	.0054	.....	
8,008	1,000	0.+	.0054	.....	
320,320	40,000	.0054	.0054	.....	
8,008	1,000	0.	.0054	.....	
320,320	40,000	.0054	.0054	.....	
8,008	1,000	0.	.0054	.....	

SECOND DIAGONAL.

8,008	1,000	0.	0.	.....	Initial load.
320,320	40,000	.0053+	.0053	.....	
8,008	1,000	0.	.0053	.....	
320,320	40,000	.0053+	.0053	.....	
8,008	1,000	.0001	.0052	.....	
320,320	40,000	.0053+	.0052	.....	
8,008	1,000	.0001+	.0052	.....	

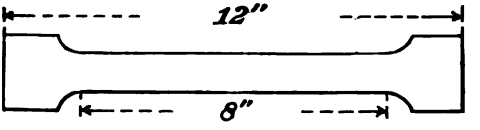
MEASUREMENTS OF SECOND DIAGONAL, END A, REPEATED.

Applied loads.		In gauged length.			Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
8,008	1,000	0.	0.	.....	Initial load.
320,320	40,000	.0051	.0051	.....	
8,008	1,000	0. +	.0051	.....	
320,320	40,000	.0051	.0051	.....	
8,008	1,000	0.	.0051	.....	
320,320	40,000	.0051	.0051	.....	
8,008	1,000	0.	.0051	.....	

STEEL PLATE FOR 5-INCH SIEGE GUN CARRIAGE.

FROM THE CONTINENTAL IRON WORKS, BROOKLYN, N. Y.

No. 6061.



Sectional area, ″.982 × ″.233 = .229 square inch.
Elastic limit, 10,240 pounds = 44,720 pounds per square inch.
Tensile strength, 14,110 pounds = 61,620 pounds per square inch.
Elongation in 8 inches, 1″.99 = 24.9 per cent.
Elongation of inch sections, ″.15 ″.23 ″.52* ″.24 ″.24 ″.22 ″.22 ″.17.
Area at fracture, ″.73 × ″.14 = .102 square inch.
Contraction of area, 55.5 per cent.
Appearance of fracture, silky.

STEEL CASTING FROM TRUCK WHEEL PLATE.

No. 4842.

Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	.0	0.	Initial load.
1,250	5,000	.000167	.000167	.0	.....	
2,500	10,000	.000367	.000200	.....	.....	
3,750	15,000	.000567	.000200	.....	.....	
5,000	20,000	.000733	.000166	.....	.....	
6,250	25,000	.000967	.000234	.....	.....	
						Elastic limit about 27,000 pounds per square inch.
7,500	30,000	.002000	.001033	.001233	.001233	
7,750	31,000	.004333	.002333	.....	.....	
8,000	32,000	.005667	.001334	.....	.....	
8,250	33,000	.007167	.001500	.....	.....	
8,500	34,000	.008500	.001333	.....	.....	
8,750	35,000	.009500	.001000	.....	.....	
9,000	36,000	.011333	.001833	.....	.....	
9,250	37,000	.012400	.001062	.....	.....	
9,500	38,000	.014333	.001933	.....	.....	
9,750	39,000	.015667	.001334	.....	.....	
10,000	40,000	.017633	.001966	.016033	.014800	
10,250	41,000	.019000	.001367	.....	.....	
10,500	42,000	.020933	.001933	.....	.....	
10,750	43,000	.022667	.001734	.....	.....	
11,000	44,000	.025267	.002600	.....	.....	
11,250	45,000	.027067	.001800	.....	.....	
11,500	46,000	.030000	.002933	.....	.....	
11,750	47,000	.032000	.002000	.....	.....	
12,000	48,000	.035000	.003000	.....	.....	
12,250	49,000	.037667	.002667	.....	.....	
12,500	50,000	.041167	.003500	.039100	.023067	Surface cracks appear.
13,000	52,000	.0500	.008833	.....	.....	
13,500	54,000	.0600	.0100	.....	.....	
14,000	56,000	.0700	.0100	.....	.....	
14,500	58,000	.0867	.0167	.....	.....	
14,960	59,850	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	59,840
Elastic limit per square inch of original section, about	do...	27,000
Elongation per inch after rupture	inch..	.1067
Reduction in diameter at point of rupture	do...	.044
Reduction in area after rupture, per cent of original section		15.0
Position of rupture		1".12 from neck
Character of broken surface		granular; cracks developed along cylindrical surface of stem
Elongation of inch sections		".12*, ".11, .".09

STEEL USED IN 12-INCH DECK PIERCING SHELLS.

No. 4860.

Marks, 12 M S D P.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 6".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000333	.000183	.....	.....	
4,000	20,000	.000650	.000317	.....	.....	
6,000	30,000	.000967	.000317	0.	.....	
7,000	35,000	.001133	.000166	.....	.....	
8,000	40,000	.001300	.000167	0.	.....	
8,200	41,000	.001333	.000033	.....	.....	
8,400	42,000	.001350	.000017	.....	.....	
8,600	43,000	.001383	.000033	.....	.....	
8,800	44,000	.001417	.000034	.....	.....	Elastic limit.
9,000	45,000	.001483	.000066	.....	.....	
9,200	46,000	.001533	.000050	.....	.....	
9,400	47,000	.005000	.003467	.....	.....	
9,600	48,000	.007583	.002583	.....	.....	
9,800	49,000	.008667	.001084	.....	.....	
10,000	50,000	.009000	.000333	.....	.....	
18,220	91,100	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,100
Elastic limit per square inch of original section	do...	44,000
Elongation per inch after rupture	inch..	.1583
Elongation per inch under strain at elastic limit	do...	.001417
Reduction in diameter at point of rupture	do...	.135
Reduction in area after rupture, per cent of original section		46.2
Position of rupture		1".7 from neck
Character of broken surface		fine silky; trace of granulation
Elongation of inch sections		".07, ".09, ".11, ".14, ".39*, ".15

No. 4861.

Marks, 12 M S D P.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 6".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000133	.000133	0.	.....	
2,000	10,000	.000300	.000167	.....	.....	
4,000	20,000	.000633	.000333	.....	.....	
6,000	30,000	.000950	.000317	0.	.....	
7,000	35,000	.001117	.000167	.....	.....	
8,000	40,000	.001283	.000166	0.	.....	
8,200	41,000	.001317	.000034	.....	.....	
8,400	42,000	.001333	.000016	.....	.....	
8,600	43,000	.001367	.000034	.....	.....	
8,800	44,000	.001400	.000033	.....	.....	
9,000	45,000	.001433	.000033	.....	.....	
9,200	46,000	.001467	.000034	.....	.....	
9,400	47,000	.001500	.000033	.....	.....	
9,600	48,000	.001533	.000033	.....	.....	Elastic limit.
9,800	49,000	.002667	.001134	.....	.....	
10,000	50,000	.003333	.000666	.....	.....	
10,200	51,000	.005833	.002500	.....	.....	
10,400	52,000	.008583	.002750	.....	.....	
10,600	53,000	.009167	.000584	.....	.....	
19,420	97,100	.....	.....	.....	.....	Tensile strength.

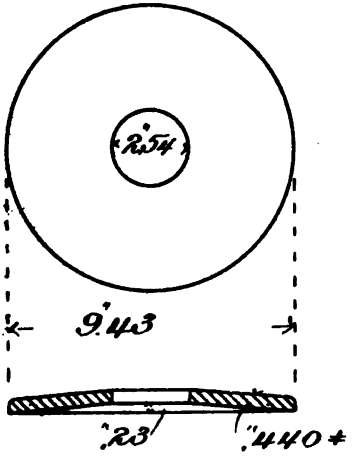
General summary.

Tensile strength per square inch of original section	pounds..	97,100
Elastic limit per square inch of original section	do....	48,000
Elongation per inch after rupture	inch..	.1817
Elongation per inch under strain at elastic limit	do....	.001533
Reduction in diameter at point of rupture	do....	.125
Reduction in area after rupture, per cent of original section		43.3
Position of rupture		1".8 from neck
Character of broken surface		fine silky; trace of granulation
Elongation of inch sections		".11, ".13, ".15, ".17, ".37*, ".16

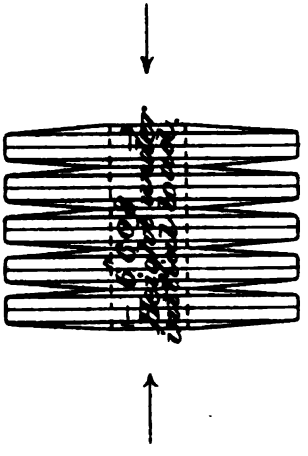
COMPRESSION OF BELLEVILLE SPRINGS.

Belleville Springs. Steel

Single Spring



Test No. 5870



BELLEVILLE SPRINGS MANUFACTURED AT WATERTOWN ARSENAL.

COMPRESSION TESTS.

No. 5870.

Test of five pairs together.

Dimensions of single spring,

	Inches.
Exterior diameter	9.43
Diameter of hole	2.54
Thickness of metal	.440±
Conicity	.23

Weight of five pairs, 78¾ pounds.

Total height of five pairs, unloaded, 6″.70.

Previous to this test the springs had been loaded with 100,000 pounds compression.

Applied loads.	Height of five pairs.	Total compression.	Successive compression or recovery.	Remarks.
Pounds.	*Inches.*	*Inches.*	*Inch.*	
1,000	6.608	0.	0.	Initial load.
2,000	6.544	.064	.064	
3,000	6.487	.121	.057	
4,000	6.433	.175	.054	
5,000	6.382	.226	.051	
6,000	6.327	.281	.055	
7,000	6.275	.333	.052	
8,000	6.222	.386	.053	
9,000	6.168	.440	.054	
10,000	6.115	.493	.053	
11,000	6.059	.549	.056	
12,000	6.002	.606	.057	
13,000	5.944	.664	.058	
14,000	5.887	.721	.057	
15,000	5.825	.783	.062	
16,000	5.765	.843	.060	
17,000	5.703	.905	.062	
18,000	5.640	.968	.063	
19,000	5.578	1.030	.062	
20,000	5.513	1.095	.065	
21,000	5.452	1.156	.061	
22,000	5.390	1.218	.062	
23,000	5.327	1.281	.063	
24,000	5.266	1.342	.061	
18,000	5.558	1.050	.292	Rested 1 hour under this load.
25,000	5.205	1.403	.353	
26,000	5.148	1.460	.057	
27,000	5.091	1.517	.057	
28,000	5.038	1.570	.053	
29,000	4.985	1.623	.053	
30,000	4.936	1.672	.049	
31,000	4.888	1.720	.048	
32,000	4.846	1.762	.042	
33,000	4.805	1.803	.041	
34,000	4.772	1.836	.033	
35,000	4.742	1.866	.030	
36,000	4.715	1.893	.027	
37,000	4.691	1.917	.024	
38,000	4.669	1.939	.022	
39,000	4.649	1.959	.020	
40,000	4.631	1.977	.018	
39,000	4.640	1.968	.009	
38,000	4.652	1.956	.012	
37,000	4.668	1.940	.016	One spring cracked.
36,000	4.685	1.923	.017	
35,000	4.704	1.904	.019	
34,000	4.723	1.885	.019	
33,000	4.745	1.863	.022	

No. 5870—Continued.

Applied loads.	Height of five pairs.	Total compression.	Successive compression or recovery.	Remarks.
Pounds.	*Inches.*	*Inches.*	*Inch.*	
32,000	4.770	1.838	0.025	
31,000	4.796	1.812	.026	
30,000	4.828	1.780	.032	
29,000	4.860	1.748	.032	
28,000	4.895	1.713	.035	
27,000	4.930	1.678	.035	
26,000	4.969	1.639	.039	
25,000	5.007	1.601	.038	
24,000	5.050	1.558	.043	
23,000	5.094	1.514	.044	
22,000	5.141	1.467	.047	
21,000	5.190	1.418	.051	
20,000	5.242	1.366	.052	
19,000	5.294	1.314	.052	
18,000	5.350	1.258	.056	
17,000	5.408	1.200	.058	
16,000	5.467	1.141	.059	
15,000	5.528	1.080	.061	
14,000	5.590	1.018	.062	
13,000	5.654	.954	.064	
12,000	5.720	.888	.066	
11,000	5.784	.824	.064	
10,000	5.850	.758	.066	
9,000	5.917	.691	.067	
8,000	5.987	.621	.070	
7,000	6.055	.553	.068	
6,000	6.127	.481	.072	
5,000	6.195	.413	.068	
4,000	6.268	.340	.073	
3,000	6.341	.267	.073	
2,000	6.416	.192	.075	
1,000	6.501	.107	.085	
	6.504	.104	.003	After resting 5 minutes.

No. 5871.

Test of five other pairs of springs.
Weight, 80 pounds.
Height of five pairs, unloaded, 6″.72.
These springs had been loaded with 100,000 pounds before testing.

Applied loads.	Height of five pairs.	Total compression.	Successive compression or recovery.	Remarks.
Pounds.	*Inches.*	*Inches.*	*Inches.*	
1,000	6.638	0.	0.	Initial load.
5,000	6.427	.211	.211	
10,000	6.168	.470	.259	
15,000	5.892	.746	.276	
18,000	5.723	.915	.169	
20,000	5.602	1.036	.121	
25,000	5.301	1.337	.301	
30,000	5.034	1.604	.267	
35,000	4.827	1.811	.207	
40,000	4.700	1.938	.127	
35,000	4.778	1.860	.078	
30,000	4.922	1.716	.144	
25,000	5.124	1 514	.202	
20,000	5.374	1.264	.250	
18,000	5.485	1.153	.111	
15,000	5.658	.980	.173	
10,000	5.965	.673	.307	
5,000	6.284	.354	.319	
1,000	6.560	.078	.276	
5,000	6.351	.287	.209	
10,000	6.088	.550	.263	
15,000	5.812	.826	.276	
18,000	5.641	.997	.171	Springs remained under this load 18 hours.
18,000	5.641	.997	0.	
19,000	5.588	1.050	.053	
20,000	5.532	1.106	.056	
21,000	5.475	1.163	.057	
22,000	5.418	1.220	.057	
23,000	5.361	1.277	.057	
24,000	5.302	1.336	.059	
25,000	5.245	1.393	.057	
26,000	5.191	1.447	.054	
27,000	5.138	1.500	.053	
28,000	5.087	1.551	.051	
27,000	5.123	1.515	.036	
26,000	5.161	1.477	.038	
25,000	5.205	1.433	.044	
24,000	5.251	1.387	.046	
23,000	5.301	1.337	.050	
22,000	5.351	1.287	.050	
21,000	5.400	1.238	.049	
20,000	5.453	1.185	.053	
19,000	5.506	1.132	.053	
18,000	5.560	1.078	.054	
29,000	5.038	1.600	.522	
18,000	5.550	1.088	.512	
29,000	5.036	1.602	.514	
18,000	5.550	1.088	.514	
1,000	6.559	.079	1.009	

Referring to the tests of five pairs each of solid Belleville springs, tests Nos. 5989 and 5990, the details of which follow, previous to making these tests the springs had been loaded with 150,000 pounds compression.

In the test of the first five pairs the loads were increased by increments of 5,000 pounds each, until the maximum, 50,000 pounds compression, was reached, an observation being taken also at 18,000 pounds.

Their behavior resembled the previous tests of springs of arsenal manufacture and those of foreign make, which in common took permanent sets when tested.

In the present instance the permanent set was ".067, or 3.8 per cent of the total compression under 50,000 pounds load.

The springs were stiffer than those with central holes in them.

At 18,000 pounds the solid springs gave ".741 and ".784 compression, against ".968 and ".915 compression for those with holes, two sets of each kind now being compared.

It has not been found practicable to increase the conicity of the solid springs, hence their greater stiffness is attributed to a more general distribution of the maximum stresses.

Comparing the amount of compression between 18,000 pounds and 35,000 pounds under ascending stresses, the solid springs compressed ".667 against ".898 for those with holes.

After loading with 50,000 pounds, the solid springs in the first test were released to 1,000 pounds compression, and then again loaded with 18,000 pounds.

Whereas under diminishing stresses, from 50,000 pounds down, the total compression of the column was ".906 at 18,000 pounds, after returning to the initial load and applying 18,000 pounds the compression was ".810; then increasing the load to 35,000 pounds and returning to 18,000 pounds the compression was ".877, thus showing the height of the springs depends in a measure upon the previous state of loading, in this respect conforming to earlier tests.

After releasing from 35,000 to 18,000 pounds, the latter load was allowed to remain acting for an interval of one-half hour, a very slight recovery in the height of the springs, ".003, occurring in the meantime.

The load was momentarily reduced to 10,000 pounds, and immediately reapplied to 18,000 pounds, after which the springs showed a recovery of ".022.

It is inferred from this behavior that while recovery is partially prevented by a sustained load, momentary relief from that load enables the metal in these springs to reassume its shape from its constrained position.

This part of the experiment was repeated, and a longer time, 21 hours, allowed the springs under 18,000 pounds load. There was no material change during this time in the height of the column of springs.

The load was reduced to 10,000 pounds and immediately reapplied as before, whereupon the springs showed a recovery of ".023 in height.

The second test with five other pairs was made in such a manner as to show the effect on an initial load of a certain amount of compression and recovery of the springs.

The height of the springs was measured at 18,000 pounds load. They were compressed ".748, equivalent to 18" compression of a column 11½ feet in height, and the load found to be 36,200 pounds corresponding to this compression.

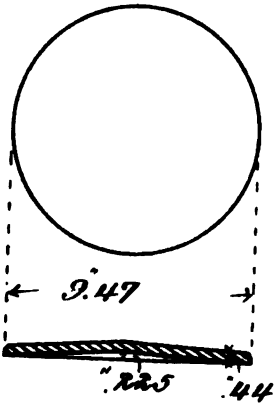
It was necessary to reduce the load to 15,150 pounds before the springs returned to the same height they occupied before being compressed.

Repeating these observations, nearly the same results were again reached, the maximum load and the load necessary to reduce to being a little lower than in the first instance.

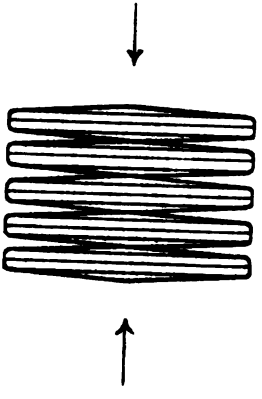
The final reading under 12,000 pounds compression showed the springs to have the same height that they occupied under 15,000 pounds, when first loaded with the latter stress.

Belleville Springs. Steel, Solid springs

Single Spring



Test No. 5989



BELLEVILLE SPRINGS.—SOLID SPRINGS, WITHOUT CENTRAL HOLES, MANUFACTURED AT WATERTOWN ARSENAL.

COMPRESSION TESTS.

No. 5989.

Test of five pairs together:

Dimensions of single spring, Inches.

Exterior diameter	9.47
Thickness of metal	.44
Average conicity	.225

Weight of five pairs, 86½ pounds.

Total height of five pairs, unloaded, 6″.65.

Previous to testing, these springs had been closed down with a load of 150,000 pounds compression.

Applied loads.	Height of five pairs.	Total compression.	Successive compression or recovery.	Remarks.
Pounds.	*Inches.*	*Inches.*	*Inch.*	
1,000	6.550	0.	0.	Initial load
5,000	6.377	.173	.173	
10,000	6.162	.388	.215	
15,000	5.940	.610	.222	
18,000	5.809	.741	.131	
20,000	5.720	.830	.089	
25,000	5.511	1.039	.209	
30,000	5.316	1.234	.195	
35,000	5.142	1.408	.174	
40,000	5.000	1.550	.142	
45,000	4.885	1.665	.115	
50,000	4.795	1.755	.090	
45,000	4.856	1.694	.061	
40,000	4.943	1.607	.087	
35,000	5.052	1.498	.109	
30,000	5.190	1.360	.138	
25,000	5.360	1.190	.170	
20,000	5.558	.992	.198	
18,000	5.644	.906	.086	
15,000	5.778	.772	.134	
10,000	6.014	.536	.236	
5,000	6.266	.284	.152	
1,000	6.483	.067	.217	
5,000	6.307	.243	.176	
10,000	6.092	.458	.215	
15,000	5.875	.675	.217	
18,000	5.740	.810	.135	
35,000	5.101	1.449	.639	
18,000	5.673	.877	.572	
35,000	5.100	1.450	.573	
18,000	5.670	.880	.570	
.....	5.673	.877	.003	After carrying load one-half hour.
18,000	5.695	.855	.022	Load diminished to 10,000 pounds and immediately reapplied.
40,000	4.976	1.574	.719	
18,000	5.659	.891	.683	
40,000	4.973	1.577	.686	
18,000	5.657	.893	.684	
18,000	5.687	.863	.030	Load diminished to 10,000 pounds and immediately reapplied.
40,000	4.973	1.577	.714	
18,000	5.656	.894	.683	
.....	5.657	.893	.001	After carrying load 21 hours.
18,000	5.680	.870	.023	Load diminished to 10,000 pounds and immediately reapplied.

Test discontinued.

No. 5990.

Compression test of five other pairs of solid Belleville springs.

Inches.

Dimensions of single springs, { Exterior diameter 9.47
Thickness of metal ..... .44
Average conicity ..... .225

Weight of five pairs, 85¼ pounds.

Total weight of five pairs, unloaded, 6″.61.

Previous to testing, these springs had been closed down with 150,000 pounds compression.

Applied loads.	Height of five pairs.	Total compression.	Successive compression or recovery.	Remarks.
Pounds.	*Inches.*	*Inches.*	*Inch.*	
1,000	6.524	0.	0.	Initial load.
15,000	5.883	.641	.641	
18,000	5.740	.784	.143	
36,200	4.992	1.532	.748	
18,000	5.603	.921	.611	
15,150	5.740	.784	.137	
36,100	4.992	1.532	.748	
18,000	5.600	.924	.608	
15,030	5.740	.784	.140	
12,000	5.883	.641	.143	

Test discontinued.

RIFLE BARREL STEEL

FROM

SPRINGFIELD ARMORY

FOR

BARRELS OF .30 AND .45 CALIBER.

No. 4759.

Marks, $\frac{A\ I}{N}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	
1,250	5,000	.000100	.000100	0.	.....	Initial load.
2,500	10,000	.000333	.000233	.....	.....	
5,000	20,000	.000667	.000334	.....	.....	
7,500	30,000	.001000	.000333	0.	.....	
8,750	35,000	.001133	.000133	.....	.....	
10,000	40,000	.001333	.000200	0.	.....	
11,250	45,000	.001467	.000134	.....	.....	
12,500	50,000	.001667	.000200	.....	.....	
13,750	55,000	.001833	.000166	.....	.....	
14,000	56,000	.001900	.000067	.....	.....	Elastic limit.
						Load fell.
12,750	51,000	.013667	.011767	.....	.....	
13,000	52,000	.018433	.004766	.....	.....	
13,250	53,000	.019067	.000634	.....	.....	
13,500	54,000	.019667	.000600	.....	.....	
13,750	55,000	.020400	.000733	.....	.....	
14,000	56,000	.021867	.001467	.....	.....	
14,250	57,000	.022700	.000833	.....	.....	
14,500	58,000	.024333	.001633	.....	.....	
15,000	60,000	.027667	.003334	.....	.....	
15,500	62,000	.030833	.003166	.....	.....	
16,000	64,000	.034667	.003834	.....	.....	
16,500	66,000	.039167	.004500	.....	.....	
17,000	68,000	.044000	.004833	.....	.....	
17,500	70,000	.050267	.006267	.....	.....	
18,000	72,000	.0600	.009733	.....	.....	
18,500	74,000	.0667	.0067	.....	.....	
19,000	76,000	.0833	.0166	.....	.....	
19,500	78,000	.1033	.0200	.....	.....	
19,950	79,800	.1733	.0700	.....	.....	Tensile strength.
16,100	.....	.....	.....	.....	.....	Load at time of rupture.

General summary.

Tensile strength per square inch of original section	pounds..	79,800
Elastic limit per square inch of original section	do...	56,000
Elongation per inch after rupture	inch..	.2767
Elongation per inch under strain at elastic limit	do...	.001900
Reduction in diameter at point of rupture	do...	.174
Reduction in area after rupture, per cent of original section		52.2
Position of rupture		1″.3 from neck
Character of broken surface		fine silky
Elongation of inch sections		″.18, ″.42, ″.23

Chemical composition.

	Per cent.
Total carbon	0.402
Graphitic carbon	0.027
Combined carbon	0.375
Manganese	0.433
Silicon	0.146
Sulphur	0.010
Phosphorus	0.031
Copper	None
Nickel	0.950

No. 4760.

Marks, $\frac{A\ I}{N}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permament set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000333	.000200	.....	.....	
5,000	20,000	.000667	.000334	.....	.....	
7,500	30,000	.001000	.000333	.....	.....	
10,000	40,000	.001333	.000333	0.	.....	
11,250	45,000	.001533	.000200	.....	.....	
12,500	50,000	.001667	.000134	.000033	.000033	
12,750	51,000	.001700	.000033	.....	.....	
13,000	52,000	.001733	.000033	.....	.....	
13,250	53,000	.001767	.000034	.....	.....	
13,500	54,000	.001800	.000033	.....	.....	
13,750	55,000	.001833	.000033	.000033	0.	
14,000	56,000	.001867	.000034	.....	.....	
14,250	57,000	.001900	.000033	.....	.....	
14,500	58,000	.001933	.000033	.....	.....	
14,750	59,000	.002000	.000067	.....	.....	Elastic limit.
						Load fell.
13,000	52,000	.004633	.002333	.....	.....	
13,250	53,000	.010000	.005367	.....	.....	
13,500	54,000	.019733	.009733	.....	.....	
13,750	55,000	.020300	.000567	.....	.....	
14,000	56,000	.021600	.001300	.....	.....	
14,250	57,000	.022333	.000733	.....	.....	
14,500	58,000	.024000	.001667	.....	.....	
14,750	59,000	.025033	.001033	.....	.....	
15,000	60,000	.026400	.001367	.....	.....	
15,500	62,000	.030367	.003967	.....	.....	
16,000	64,000	.037000	.006633	.....	.....	
16,500	66,000	.038333	.001333	.....	.....	
17,000	68,000	.043733	.005400	.....	.....	
17,500	70,000	.049167	.005434	.....	.....	
18,000	72,000	.0600	.010833	.....	.....	
18,500	74,000	.0667	.0067	.....	.....	
19,000	76,000	.0767	.0100	.....	.....	
19,500	78,000	.1000	.0233	.....	.....	
20,000	80,000	.1600	.0600	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	80,000
Elastic limit per square inch of original section	do...	59,000
Elongation per inch after rupture	inch..	.2600
Elongation per inch under strain at elastic limit	do...	.002000
Reduction in diameter at point of rupture	do...	.174
Reduction in area after rupture, per cent of original section		52.2
Position of rupture		1″.5 from neck
Character of broken surface		fine silky
Elongation of inch sections		″.15, ″.40*, ″.23

No. 4761.

Marks, $\frac{P\,B}{G}$
Diameter, ″.564.
Section area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000333	.000200	.....	.....	
5,000	20,000	.000667	.000334	.....	.....	
7,500	30,000	.001000	.000333	0.	.....	
8,750	35,000	.001167	.000167	.....	.....	
10,000	40,000	.001333	.000166	0.	.....	
11,250	45,000	.001533	.000200	.....	.....	Elastic limit.
						Load fell.
10,250	41,000	.003667	.002134	.....	.....	
10,500	42,000	.020667	.001700	.....	.....	
10,750	43,000	.021667	.001000	.....	.....	
11,000	44,000	.023267	.001600	.....	.....	
11,250	45,000	.025333	.002066	.....	.....	
11,500	46,000	.027667	.002334	.....	.....	
11,750	47,000	.029700	.002033	.....	.....	
12,000	48,000	.032667	.002967	.....	.....	
12,250	49,000	.035167	.002500	.....	.....	
12,500	50,000	.038733	.003566	.....	.....	
13,000	52,000	.045667	.006934	.....	.....	
13,500	54,000	.054333	.008666	.....	.....	
14,000	56,000	.0667	.012367	.....	.....	
14,500	58,000	.0800	.0133	.....	.....	
15,000	60,000	.0933	.0133	.....	.....	
15,500	62,000	.1233	.0300	.....	.....	
15,980	63,920	.2100	.0867	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	63,920
Elastic limit per square inch of original section	do...	45,000
Elongation per inch after rupture	inch..	.3233
Elongation per inch under strain at elastic limit	do...	.001533
Reduction in diameter at point of rupture	do...	.184
Reduction in area after rupture, per cent of original section		54.6
Position of rupture		1″.8 from neck
Character of broken surface		fine silky
Elongation of inch sections		″.21, ″.53*, ″.23

Chemical composition.

	Per cent.
Total carbon	0.137
Graphitic carbon	0.012
Combined carbon	0.125
Manganese	0.760
Silicon	0.015
Sulphur	0.100
Phosphorus	0.063
Copper	0.025

No. 4762.

Marks, $\frac{P\ B}{G}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000333	.000233	.....	.....	
5,000	20,000	.000667	.000334	.....	.....	
7,500	30,000	.001000	.000333	.....	.....	
8,750	35,000	.001167	.000167	.....	.....	
10,000	40,000	.001333	.000166	.000033	.000033	
10,250	41,000	.001367	.000034	.....	.....	
10,500	42,000	.001400	.000033	.....	.....	
10,750	43,000	.001433	.000033	.....	.....	
11,000	44,000	.001467	.000034	.....	.....	Elastic limit.
						Load fell.
10,000	40,000	.003033	.001566	.....	.....	
10,250	41,000	.003500	.000467	.....	.....	
10,500	42,000	.013400	.009900	.....	.....	
10,750	43,000	.022467	.009067	.....	.....	
11,000	44,000	.023333	.000866	.....	.....	
11,250	45,000	.025167	.001834	.....	.....	
11,500	46,000	.027000	.001833	.....	.....	
11,750	47,000	.029333	.002333	.....	.....	
12,000	48,000	.032333	.002000	.....	.....	
12,250	49,000	.034833	.002500	.....	.....	
12,500	50,000	.039000	.004167	.....	.....	
13,000	52,000	.044333	.005333	.....	.....	
13,500	54,000	.054833	.010500	.....	.....	
14,000	56,000	.0667	.011867	.....	.....	
14,500	58,000	.0800	.0133	.....	.....	
15,000	60,000	.1000	.0200	.....	.....	
15,500	62,000	.1200	.0200	.....	.....	
15,980	63,920	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	63,920
Elastic limit per square inch of original section	do...	44,000
Elongation per inch after rupture	inch..	.3233
Elongation per inch under strain of elastic limit	do...	.001467
Reduction in diameter at point of rupture	do...	.194
Reduction in area after rupture, per cent of original section		57.0
Position of rupture		1″.9 from neck
Character of broken surface		fine silky
Elongation of inch sections		″.22, ″.58*, ″.22

No. 4802.

Marks, P B C 1.
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load
1,250	5,000	.000067	.000067	0.	.....	
2,500	10,000	.000300	.000233	.....	.....	
5,000	20,000	.000667	.000367	.....	.....	
7,500	30,000	.001000	.000333	0.	.....	
10,000	40,000	.001333	.000333	0.	.....	
12,500	50,000	.001700	.000367	0.	.....	
12,750	51,000	.001733	.000033	.....	.....	
13,000	52,000	.001800	.000067	.....	.....	
13,250	53,000	.001867	.000067	.....	.....	
13,500	54,000	.001900	.000033	.....	.....	
13,750	55,000	.001933	.000033	.....	.....	Elastic limit.
		.015033	.013100	.....	.....	
14,000	56,000	.015333	.000300	.....	.....	
14,250	57,000	.015700	.000367	.....	.....	
14,500	58,000	.016333	.000633	.....	.....	
14,750	59,000	.017167	.000834	.....	.....	
15,000	60,000	.018167	.001000	.....	.....	
15,500	62,000	.020333	.002166	.....	.....	
16,000	64,000	.022333	.002000	.....	.....	
16,500	66,000	.024500	.002167	.....	.....	
17,000	68,000	.027000	.002500	.....	.....	
17,500	70,000	.030000	.003000	.....	.....	
18,000	72,000	.032667	.002667	.....	.....	
18,500	74,000	.035667	.003000	.....	.....	
19,000	76,000	.038667	.003000	.....	.....	
19,500	78,000	.042333	.003666	.....	.....	
20,000	80,000	.047000	.004667	.....	.....	
20,500	82,000	.052333	.005333	.....	.....	
21,000	84,000	.058667	.006334	.....	.....	
21,500	86,000	.0700	.011333	.....	.....	
22,000	88,000	.0833	.0133	.....	.....	
22,500	90,000	.0967	.0134	.....	.....	
22,970	91,880	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,880
Elastic limit per square inch of original section	do...	55,000
Elongation per inch after rupture	inch..	.1967
Elongation per inch under strain at elastic limit	do...	.001933
Reduction in diameter at point of rupture	do...	.134
Reduction in area after rupture, per cent of original section		41.9
Position of rupture		".94 from neck
Character of broken surface		silky
Elongation of inch sections		".10, ".17, ".32*

No. 4843.

Marks, P B 1.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000333	.000200	0.	.....	
5,000	20,000	.000667	.000334	0.	.....	
7,500	30,000	.001000	.000333	0.	.....	
10,000	40,000	.001400	.000400	0.	.....	
10,250	41,000	.001433	.000033	.....	.....	
10,500	42,000	.001500	.000067	.....	.....	
10,750	43,000	.001567	.000067	.....	.....	
11,000	44,000	.001600	.000033	.....	.....	
11,250	45,000	.001633	.000033	.....	.....	Elastic limit.
11,500	46,000	.019333	.017700	.....	.....	
11,750	47,000	.021333	.002000	.....	.....	
12,000	48,000	.022500	.001167	.....	.....	
12,250	49,000	.024400	.001900	.....	.....	
12,500	50,000	.026667	.002267	.....	.....	
17,800	71,200	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	71,200
Elastic limit per square inch of original section	do...	45,000
Elongation per inch after rupture	inch..	.2933
Elongation per inch under strain at elastic limit	do...	.001633
Reduction in diameter at point of rupture	do...	.164
Reduction in area after rupture, per cent of original section		49.7
Position of rupture		1″.72 from neck
Character of broken surface		fine silky
Elongation of inch sections		″.19, ″.45*, ″.23

No. 4844.

Marks, P B 1.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000333	.000233	0.	.....	
5,000	20,000	.000667	.000334	0.	.....	
7,500	30,000	.001033	.000366	0.	.....	
10,000	40,000	.001333	.000300	—.000033	—.000033	
10,250	41,000	.001367	.000034	.....	.....	
10,500	42,000	.001400	.000033	.....	.....	
10,750	43,000	.001433	.000033	.....	.....	
11,000	44,000	.001500	.000067	.....	.....	
11,250	45,000	.001600	.000100	.....	.....	
11,500	46,000	.001633	.000033	.....	.....	
11,750	47,000	.001667	.000034	.....	.....	Elastic limit.
12,000	48,000	.030333	.028666	.....	.....	
17,100	68,400	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	68,400
Elastic limit per square inch of original section	do	47,000
Elongation per inch after rupture	inch	.3133
Elongation per inch under strain at elastic limit	do	.001667
Reduction in diameter at point of rupture	do	.194
Reduction in area after rupture, per cent of original section		57.0
Position of rupture		1″.60 from neck
Character of broken surface		silky, cup shaped
Elongation of inch sections		″.24, ″.50*, ″.20

No. 4845.

Marks, A I.
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000333	.000200	0.	.....	
5,000	20,000	.000700	.000367	0.	.....	
7,500	30,000	.001033	.000333	0.	.....	
10,000	40,000	.001367	.000334	0.	.....	
12,500	50,000	.001733	.000366	.....	.....	
15,000	60,000	.002067	.000334	.....	.....	
15,500	62,000	.002200	.000133	.....	.....	
16 000	64,000	.002300	.000100	.....	.....	
16,500	66,000	.002333	.000033	.....	.....	
17,000	68,000	.002367	.000034	.....	.....	Elastic limit.
17,500	70,000	.002467	.000100	.....	.....	
18 000	72,000	.002600	.000133	.....	.....	
18,500	74,000	.003500	.000900	.....	.....	
19,000	76,000	.015000	.011500	.....	.....	
19,500	78,000	.016333	.001333	.....	.....	
20,000	80,000	.018333	.002000	.....	.....	
20,500	82,000	.020000	.001667	.....	.....	
21,000	84,000	.022000	.002000	.....	.....	
21,500	86,000	.024000	.002000	.....	.....	
22,000	88,000	.026000	.002000	.....	.....	
22,500	90,000	.028500	.002500	.....	.....	
28,100	112,400	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	112,400
Elastic limit per square inch of original section	do...	68,000
Elongation per inch after rupture	inch..	.1733
Elongation per inch under strain at elastic limit	do...	.002367
Reduction in diameter at point of rupture	do...	.114
Reduction in area after rupture, per cent of original section		36.4
Position of rupture		1".54 from neck
Character of broken surface		silky
Elongation of inch sections		".12, ".29*, ".11

No. 4848.

Marks, 1909 M 2.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000667	.000367	.....	.....	
7,500	30,000	.001033	.000366	0.	.....	
10,000	40,000	.001367	.000334	0.	.....	
12,500	50,000	.001733	.000366	.....	.....	
15,000	60,000	.002067	.000334	.....	.....	
15,250	61,000	.002100	.000033	.....	.....	
15,500	62,000	.002133	.000033	.....	.....	
15,750	63,000	.002167	.000034	.....	.....	Elastic limit.
16,000	64,000	.002267	.000100	.....	.....	
16,250	65,000	.002400	.000133	.....	.....	
16,500	66,000	.002500	.000100	.....	.....	
16,750	67,000	.002733	.000233	.....	.....	
17,000	68,000	.003167	.000434	.....	.....	
17,250	69,000	.003400	.000233	.....	.....	
17,500	70,000	.003800	.000400	.....	.....	
18,000	72,000	.004700	.000900	.....	.....	
18,500	74,000	.005333	.000633	.....	.....	
19,000	76,000	.006067	.000734	.....	.....	
19,500	78,000	.006667	.000600	.....	.....	
20,000	80,000	.007667	.001000	.....	.....	
35,260	141,040	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	141,040
Elastic limit per square inch of original section	do...	63,000
Elongation per inch after rupture	inch..	.1067
Elongation per inch under strain at elastic limit	do...	.002167
Reduction in diameter at point of rupture	do...	.044
Reduction in area after rupture, per cent of original section		15.0
Position of rupture		1″.1 from neck
Character of broken surface		granular, radiating from a center punch mark in circumference
Elongation of inch sections		″.12*, ″.11*, ″.09

No. 4849.

Marks, 8068 M 3.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000333	.000233	.....	.....	
5,000	20,000	.000633	.000300	.....	.....	
7,500	30,000	.001000	.000367	0.	.....	
10,000	40,000	.001333	.000333	.....	.....	
11,250	45,000	.001500	.000167	.....	.....	
12,500	50,000	.001667	.000167	0.	.....	
12,750	51,000	.001700	.000033	.....	.....	
15,000	60,000	.002033	.000333	0.	.....	
15,250	61,000	.002067	.000034	.....	.....	
15,500	62,000	.002100	.000033	.....	.....	
15,750	63,000	.002133	.000033	.....	.....	
16,000	64,000	.002167	.000034	.....	.....	
16,250	65,000	.002200	.000033	.....	.....	
16,500	66,000	.002267	.000067	.....	.....	
16,750	67,000	.002333	.000066	.....	.....	
17,000	68,000	.002367	.000034	.....	.....	
17,250	69,000	.002400	.000033	.....	.....	Elastic limit.
17,500	70,000	.002500	.000100	.....	.....	
17,750	71,000	.006167	.003667	.....	.....	
18,000	72,000	.006833	.000666	.....	.....	
18,500	74,000	.007767	.000934	.....	.....	
19,000	76,000	.008933	.001166	.....	.....	
19,500	78,000	.010000	.001067	.....	.....	
20,000	80,000	.011067	.001067	.....	.....	
32,110	128,440	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	128,440
Elastic limit per square inch of original section	do...	69,000
Elongation per inch after rupture	inch..	.1567
Elongation per inch under strain at elastic limit	do...	.002400
Reduction in diameter at point of rupture	do...	.104
Reduction in area after rupture, per cent of original section		33.5
Position of rupture		1″.6 from neck
Character of broken surface		silky, interspersed with fine granulation at the circumference
Elongation of inch sections		″.10, ″.27*, ″.10

No. 4850.

Marks, 8622 M 1.
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000967	.000334	0.	.....	
10,000	40,000	.001333	.000366	.....	.....	
12,500	50,000	.001700	.000367	0.	.....	
15,000	60,000	.002033	.000333	.000033	.000033	
17,500	70,000	.002367	.000334	.000033	0.	
17,750	71,000	.002400	.000033	.....	.....	
18,000	72,000	.002433	.000033	.....	.....	
18,250	73,000	.002500	.000067	.....	.....	Elastic limit.
18,500	74,000	.002600	.000100	.....	.....	
18,750	75,000	.002667	.000067	.....	.....	
19,000	76,000	.002800	.000133	.....	.....	
19,250	77,000	.003067	.000267	.....	.....	
19,500	78,000	.004067	.001000	.....	.....	
20,000	80,000	.005033	.000966	.....	.....	
20,500	82,000	.006000	.000967	.....	.....	
21,000	84,000	.006667	.000667	.....	.....	
21,500	86,000	.007433	.000766	.....	.....	
22,000	88,000	.008167	.000734	.....	.....	
22,500	90,000	.009067	.000900	.....	.....	
29,810	119,240	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of the original section	pounds..	119,240
Elastic limit per square inch of original section	do...	73,000
Elongation per inch after rupture	inch..	.0200
Elongation per inch under strain at elastic limit	do...	.002500
Reduction in diameter at point of rupture	do...	.004
Reduction in area after rupture, per cent of original section		1.5
Position of rupture		".8 from neck
Character of broken surface		fine granular, radiating from a spot near the center of the fractured surface.
Elongation of inch sections		".03*, ".02, ".01

No. 4880.

Marks, A I 2.
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	.....	
2,500	10,000	.000333	.000266	.....	.....	
5,000	20,000	.000667	.000334	.....	.....	
7,500	30,000	.001033	.000366	0.	.....	
10,000	40,000	.001333	.000300	0.	.....	
11,250	45,000	.001567	.000234	.....	.....	
12,500	50,000	.001700	.000133	.....	.....	
13,750	55,000	.001933	.000233	.....	.....	
14,000	56,000	.002000	.000067	.....	.....	
14,250	57,000	.002000	0.	.....	.....	
14,500	58,000	.002033	.000033	.....	.....	
14,750	59,000	.002033	0.	.....	.....	
15,000	60,000	.002067	.000034	.000033	.000033	Elastic limit.
15,250	61,000	.010367	.008300	.....	.....	
15,500	62,000	.011267	.000900	.....	.....	
15,750	63,000	.011700	.000433	.....	.....	
16,000	64,000	.012667	.000967	.....	.....	
16,250	65,000	.013533	.000866	.....	.....	
16,500	66,000	.014400	.000867	.....	.....	
17,000	68,000	.016167	.001767	.....	.....	
17,500	70,000	.018400	.002233	.....	.....	
18,000	72,000	.020167	.001767	.....	.....	
18,500	74,000	.022500	.002333	.....	.....	
19,000	76,000	.024667	.002167	.....	.....	
19,500	78,000	.027333	.002666	.....	.....	
20,000	80,000	.029667	.002334	.....	.....	
20,500	82,000	.032667	.003000	.....	.....	
21,000	84,000	.036000	.003333	.....	.....	
21,500	86,000	.039333	.003333	.....	.....	
22,000	88,000	.044000	.004667	.....	.....	
22,500	90,000	.048333	.004333	.....	.....	
23,000	92,000	.054000	.005667	.....	.....	
23,500	94,000	.0600	.0060	.....	.....	
24,000	96,000	.0733	.0133	.....	.....	
24,500	98,000	.0900	.0167	.....	.....	
24,910	99,640	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	99,640
Elastic limit per square inch of original section	do...	60,000
Elongation per inch after rupture	inch..	.1900
Elongation per inch under strain at elastic limit	do...	.002067
Reduction in diameter at point of rupture	do...	.104
Reduction in area after rupture, per cent of original section		33.5
Position of rupture		1".5 from neck
Character of broken surface		silky, 50 per cent; fine granular, 50 per cent
Elongation of inch sections		".13, ".28, ".16

Chemical composition.

	Per cent.
Total carbon	0.354
Graphitic carbon	0.029
Combined carbon	0.325
Manganese	0.677
Silicon	0.047
Sulphur	0.057
Phosphorus	0.023
Copper	0.000

No. 4881.

Marks, S J N.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000333	.000233	.....	.....	
5,000	20,000	.000700	.000367	.....	.....	
7,500	30,000	.001000	.000300	0.	.....	
8,750	35,000	.001200	.000200	.....	.....	
10,000	40,000	.001367	.000167	0.	.....	
11,250	45,000	.001567	.000200	.....	.....	
12,500	50,000	.001700	.000133	0.	.....	
13,750	55,000	.001933	.000233	.....	.....	
14,000	56,000	.002000	.000067	.....	.....	Elastic limit.
14,250	57,000	.010200	.008200	.....	.....	
14,500	58,000	.011700	.001500	.....	.....	
14,750	59,000	.012400	.000700	.....	.....	
15,000	60,000	.013667	.001267	.....	.....	
15,250	61,000	.015000	.001333	.....	.....	
15,500	62,000	.016000	.001000	.....	.....	
15,750	63,000	.017000	.001000	.....	.....	
16,000	64,000	.017700	.000700	.....	.....	
16,500	66,000	.020667	.002967	.....	.....	
17,000	68,000	.023333	.002666	.....	.....	
17,500	70,000	.026333	.003000	.....	.....	
18,000	72,000	.029333	.003000	.....	.....	
18,500	74,000	.033000	.003667	.....	.....	
19,000	76,000	.036333	.003333	.....	.....	
19,500	78,000	.041000	.004667	.....	.....	
20,000	80,000	.046000	.005000	.....	.....	
20,500	82,000	.051333	.005333	.....	.....	
21,000	84,000	.057333	.006000	.....	.....	
21,500	86,000	.066333	.009000	.....	.....	
22,000	88,000	.079667	.013334	.....	.....	
22,500	90,000	.1000	.020333	.....	.....	
22,860	91,440	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,440
Elastic limit per square inch of original section	do...	56,000
Elongation per inch after rupture	inch..	.2367
Elongation per inch under strain at elastic limit	do....	.002000
Reduction in diameter at point of rupture	do....	.174
Reduction in area after rupture, per cent of original section		52.2
Position of rupture		1″.5 from neck
Character of broken surface		fine silky, cup shaped
Elongation of inch sections		″.14, ″.40*, ″.17

Chemical composition.

	Per cent.
Total carbon	0.320
Graphitic carbon	0.040
Combined carbon	0.280
Manganese	0.660
Silicon	0.173
Sulphur	0.057
Phosphorus	0.022
Copper	0.000
Nickel	3.152

No. 4886.

Marks, W L 1.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	.....	
2,500	10,000	.000267	.000200	.....	.....	
5,000	20,000	.000600	.000333	.....	.....	
7,500	30,000	.000933	.000333	0.	.....	
10,000	40,000	.001267	.000334	0.	.....	
11,250	45,000	.001433	.000166	.....	.....	
12,500	50,000	.001600	.000167	.....	.....	
13,750	55,000	.001767	.000167	.....	.....	
15,000	60,000	.002000	.000233	.....	.....	Elastic limit.
15,250	61,000	.002667 .008167	.000667 .005500	.....	.....	
15,500	62,000	.009067	.000900	.....	.....	
15,750	63,000	.010000	.000933	.....	.....	
16,000	64,000	.010600	.000600	.....	.....	
16,250	65,000	.011333	.000733	.....	.....	
16,500	66,000	.012333	.001000	.....	.....	
17,000	68,000	.014067	.001734	.....	.....	
17,500	70,000	.016000	.001933	.....	.....	
18,000	72,000	.017833	.001833	.....	.....	
18,500	74,000	.020000	.002167	.....	.....	
19,000	76,000	.022167	.002167	.....	.....	
19,500	78,000	.024667	.002500	.....	.....	
20,000	80,000	.027000	.002333	.....	.....	
20,500	82,000	.029667	.002667	.....	.....	
21,000	84,000	.032700	.003033	.....	.....	
21,500	86,000	.036333	.003633	.....	.....	
22,000	88,000	.040000	.003667	.....	.....	
22,500	90,000	.044833	.004833	.....	.....	
23,000	92,000	.0500	.005167	.....	.....	
23,500	94,000	.0600	.0100	.....	.....	
24,000	96,000	.0667	.0067	.....	.....	
24,500	98,000	.0800	.0133	.....	.....	
25,000	100,000	.1133	.0333	.....	.....	
25,120	100,480	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	100,480
Elastic limit per square inch of original section	do...	60,000
Elongation per inch after rupture	inch..	.2000
Elongation per inch under strain at elastic limit	do...	.002000
Reduction in diameter at point of rupture	do...	.144
Reduction in area after rupture, per cent of original section		44.6
Position of rupture		1.″2 from neck
Character of broken surface		fine silky
Elongation of inch sections		″.29*, ″.21, ″.10

No. 4887.

Marks, W L_2.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	.....	
2,500	10,000	.000300	.000233	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000967	.000334	0.	.....	
10,000	40,000	.001300	.000333	0.	.....	
11,250	45,000	.001433	.000133	.....	.....	
12,500	50,000	.001633	.000200	0.	.....	
13,750	55,000	.001767	.000134	.....	.....	Elastic limit.
14,000	56,000	.014400	.012633	.....	.....	
14,250	57,000	.015233	.000833	.....	.....	
14,500	58,000	.016067	.000834	.....	.....	
14,750	59,000	.016933	.000866	.....	.....	
15,000	60,000	.018000	.001067	.....	.....	
15,500	62,000	.020167	.002167	.....	.....	
16,000	64,000	.022333	.002166	.....	.....	
16,500	66,000	.024833	.002500	.....	.....	
17,000	68,000	.027333	.002500	.....	.....	
17,500	70,000	.030333	.003000	.....	.....	
18,000	72,000	.033000	.002667	.....	.....	
18,500	74,000	.036333	.003333	.....	.....	
19,000	76,000	.040333	.004000	.....	.....	
19,500	78,000	.044667	.004334	.....	.....	
20,000	80,000	.049333	.004666	.....	.....	
20,500	82,000	.055333	.006000	.....	.....	
21,000	84,000	.061667	.006334	.....	.....	
21,500	86,000	.069667	.008000	.....	.....	
22,000	88,000	.0833	.013663	.....	.....	
22,500	90,000	.0967	.0134	.....	.....	
23,000	92,000	.1433	.0466	.....	.....	
23,020	92,080	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	92,080
Elastic limit per square inch of original section	do...	55,000
Elongation per inch after rupture	inch..	.2433
Elongation per inch under strain at elastic limit	do...	.001767
Reduction in diameter at point of rupture	do...	.164
Reduction in area after rupture, per cent of original section		49.7
Position of rupture		1″.2 from neck
Character of broken surface		fine silky
Elongation of inch sections		″.35*, ″.24, ″.14

No. 4907.

Marks, J S I.
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	.....	
2,500	10,000	.000300	.000233	.....	.....	
5,000	20,000	.000600	.000300	.....	.....	
7,500	30,000	.000967	.000367	—.000033	—.000033	
10,000	40,000	.001300	.000333	—.000033	0.	
11,250	45,000	.001400	.000100	.....	.....	
12,500	50,000	.001633	.000233	.000033	.000066	
12,750	51,000	.001667	.000034	.....	.....	
13,000	52,000	.001667	0.	.....	.....	
13,250	53,000	.001700	.000033	.....	.....	
13,500	54,000	.001700	0.	.....	.....	
13,750	55,000	.001733	.000033	.....	.....	
14,000	56,000	.001800	.000067	.....	.....	
14,250	57,000	.001867	.000067	.....	.....	
14,500	58,000	.001900	.000033	.....	.....	
14,750	59,000	.001967	.000067	.....	.....	
15,000	60,000	.002000	.000033	.....	.....	Elastic limit.
15,250	61,000	.002667	.000667	.....	.....	
15,500	62,000	.014667	.012000	.....	.....	
15,750	63,000	.015333	.000666	.....	.....	
16,000	64,000	.016267	.006934	.....	.....	
16,250	65,000	.017333	.001066	.....	.....	
16,500	66,000	.018467	.001134	.....	.....	
16,750	67,000	.019400	.000932	.....	.....	
17,000	68,000	.020500	.001100	.....	.....	
17,250	69,000	.021667	.001167	.....	.....	
17,500	70,000	.023000	.001333	.....	.....	
18,000	72,000	.025333	.002333	.....	.....	
18,500	74,000	.028000	.002667	.....	.....	
19,000	76,000	.031333	.003333	.....	.....	
19,500	78,000	.034667	.003334	.....	.....	
20,000	80,000	.038333	.003666	.....	.....	
23,900	95.600	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	95,600
Elastic limit per square inch of original section	do...	60,000
Elongation per inch after rupture	inch..	.2133
Elongation per inch under strain at elastic limit	do...	.002000
Reduction in diameter at point of rupture	do...	.124
Reduction in area after rupture, per cent of original section		39.2
Position of rupture		1".80 from neck
Character of broken surface		silky
Elongation of inch sections		".15, ".35*, ".14

No. 4908.

Marks, J S 2.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	.....	
2,500	10,000	.000300	.000233	.....	.....	
5,000	20,000	.000633	.000333	.....	.....	
7,500	30,000	.000967	.000334	0.	.....	
10,000	40,000	.001300	.000333	0.	.....	
11,250	45,000	.001467	.000167	.....	.....	
12,500	50,000	.001667	.000200	.....	.....	
12,750	51,000	.001667	0.	.....	.....	
13,000	52,000	.001700	.000033	.....	.....	
13,250	53,000	.001700	0.	.....	.....	
13,500	54,000	.001733	.000033	.....	.....	
13,750	55,000	.001767	.000034	.....	.....	
14,000	56,000	.001800	.000033	.....	.....	
14,250	57,000	.001900	.000100	.....	.....	
14,500	58,000	.001967	.000067	.....	.....	
14,750	59,000	.001967	0.	.....	.....	Elastic limit.
15,000	60,000	.012167	.010200	.....	.....	
15,250	61,000	.012833	.000666	.....	.....	
15,500	62,000	.013700	.000667	.....	.....	
15,750	63,000	.014700	.001000	.....	.....	
16,000	64,000	.015667	.000967	.....	.....	
16,250	65,000	.016667	.001000	.....	.....	
16,500	66,000	.017667	.001000	.....	.....	
16,750	67,000	.018767	.001100	.....	.....	
17,000	68,000	.020000	.001233	.....	.....	
17,250	69,000	.021000	.001000	.....	.....	
17,500	70,000	.022333	.001333	.....	.....	
18,000	72,000	.024500	.002167	.....	.....	
18,500	74,000	.027500	.003000	.....	.....	
19,000	76,000	.030667	.003167	.....	.....	
19,500	78,000	.033500	.002833	.....	.....	
20,000	80,000	.037067	.003567	.....	.....	
20,500	82,000	.043333	.006266	.....	.....	
21,000	84,000	.0467	.003367	.....	.....	
21,500	86,000	.0533	.0066	.....	.....	
23,950	95,800	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	95,800
Elastic limit per square inch of original section	do....	59,000
Elongation per inch after rupture	inch..	.2000
Elongation per inch under strain at elastic limit	do....	.001967
Reduction in diameter at point of rupture	do....	.094
Reduction in area after rupture, per cent of original section		30.6
Position of rupture		1″.70 from neck
Character of broken surface		silky
Elongation of inch sections		″.16, ″.29*, ″.15

No. 4818.

Marks, B A I[1].
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000667	.000367	.....	.....	
7,500	30,000	.001033	.000366	0.	.....	
8,750	35,000	.001200	.000167	.....	.....	
10,000	40,000	.001367	.000167	0.	.....	
12,500	50,000	.001700	.000333	0.	.....	
13,750	55,000	.001867	.000167	.....	.....	
15,000	60,000	.002033	.000166	0.	.....	
16,250	65,000	.002267	.000234	0.	.....	
16,500	66,000	.002300	.000033	.....	.....	
16,750	67,000	.002333	.000033	.....	.....	Elastic limit. Load fell.
16,000	64,000	.008000	.005667	.....	.....	
16,250	65,000	.015000	.007000	.....	.....	
16,500	66,000	.015400	.000400	.....	.....	
16,750	67,000	.015767	.000367	.....	.....	
17,000	68,000	.016400	.000633	.....	.....	
17,250	69,000	.017667	.001267	.....	.....	
17,500	70,000	.018667	.001000	.....	.....	
18,000	72,000	.020667	.002000	.....	.....	
18,500	74,000	.023067	.002400	.....	.....	
19,000	76,000	.025333	.002266	.....	.....	
19,500	78,000	.028000	.002667	.....	.....	
20,000	80,000	.030667	.002667	.....	.....	
20,500	82,000	.033667	.003000	.....	.....	
21,000	84,000	.037000	.003333	.....	.....	
21,500	86,000	.040667	.003667	.....	.....	
22,000	88,000	.044667	.004000	.....	.....	
22,500	90,000	.049333	.004666	.....	.....	
23,000	92,000	.0567	.007367	.....	.....	
23,500	94,000	.0633	.0066	.....	.....	
24,000	96,000	.0700	.0067	.....	.....	
24,500	98,000	.0833	.0133	.....	.....	
25,000	100,000	.1100	.0267	.....	.....	
25,180	100,720	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	100,720
Elastic limit per square inch of original section	do...	67,000
Elongation per inch after rupture	inch..	.19000
Elongation per inch under strain at elastic limit	do...	.002333
Reduction in diameter at point of rupture	do...	.094
Reduction in area after rupture, per cent of original section		30.6
Position of rupture		1.3" from neck
Character of broken surface		fine granular, 60 per cent; fine silky, 40 per cent
Elongation of inch sections		".14, ".25*, ".18

RIFLE BARREL STEEL FROM SPRINGFIELD ARMORY.

[For barrels .30 and .45 caliber. Tabulation of tension specimens.]

No. of test.	Mark on specimen.	Diameter.	Sectional area.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation in 8 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.	Elongation of inch sections.		
		Inch.	*Sq. in.*	*Pounds.*	*Pounds.*	*Inch.*	*Per ct.*	*Inch. Sq. in.*	*Per ct.*		*Inch.*	*Inch.*	*Inch*
4759	A I N	0.564	0.25	56,000	79,800	0.83	27.7	Diam..39=.119	52.2	Fine silky	.18,	.42*,	.23
4760	.....do	.564	.25	59,000	80,000	.78	26.0	Diam.,.39=.119	52.2	.....do	.15,	.40*,	.23
4761	P B G	.564	.25	45,000	63,920	.97	32.3	Diam.,.38=.113	54.6	.....do	.21,	.53*,	.23
4762	.....do	.564	.25	44,000	63,920	.97	32.3	Diam.,.37=.108	57.0	.....do	.22,	.53*,	.22
4802	P B C 1	.564	.25	55,000	91,880	.59	19.7	Diam.,.43=.145	41.9	Silky	.10,	.17,	.32*
4843	P B 1	.564	.25	45,000	71,200	.88	29.3	Diam.,.40=.126	49.7	Fine silky	.19,	.46*,	.23
4844	.....do	.564	.25	47,000	68,400	.94	31.3	Diam.,.37=.108	57.0	Silky, cup-shaped	.24,	.50*,	.20
4845	A I	.564	.25	68,000	112,400	.52	17.3	Diam.,.45=,159	36.4	Silky	.12,	.29*,	.11
4848	1909 M 2	.564	.25	63,000	141,040	.32	10.7	Diam.,.52=.212	15.0	Granular	.12*,	.11*,	.09
4849	8068 M 3	.564	.25	69,000	128,449	.47	15.7	Diam.,.46=.166	33.5	Silky and fine granular	.10,	.27*,	.10
4850	8622 M 1	.564	.25	73,000	119,240	.06	2.0	Diam.,.56=.246	1.5	Fine granular	.03*,	.02,	.01
4880	A I 2	.564	.25	60,000	99,640	.57	19.0	Diam.,.46=.166	33.5	Silky, 50 per cent; fine granular, 50 per cent	.13,	.28*,	.16
4881	S J N	.564	.25	56,000	91,440	.71	23.7	Diam.,.39=.119	52.2	Fine silky, cup-shaped	.14,	.40*,	.17
4886	W L 1	.564	.25	60,000	100,480	.60	20.0	Diam.,.42=.139	44.6	Fine silky	.29*,	.21,	.10
4887	W L 2	.564	.25	55,000	92,080	.73	24.3	Diam.,.40=.126	49.7	.....do	.35*,	.24,	.14
4907	J S I	.564	.25	60,000	95,600	.64	21.3	Diam.,.44=.152	39.2	Silky	.15,	.35*,	.14
4908	J S 2	.564	.25	59,000	95,800	.60	20.0	Diam.,.47=.174	30.6	.....do	.16,	.29*,	.15
4818	B A I	.564	.25	67,600	100,720	.57	19.0	Diam.,.47=.174	30.6	Fine granular, 60 per cent; fine silky, 40 per cent	.14,	.25*,	.18

NICKEL STEEL

FROM

ORDNANCE BUREAU, UNITED STATES NAVY.

235

NICKEL STEEL FROM ORDNANCE BUREAU, UNITED STATES NAVY.

No. 4816.

Marks, U. S. N. 1.
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000333	.000233	.....	.....	
5,000	20,000	.000767	.000434	0.	.....	
6,250	25,000	.001000	.000233	.....	.....	
7,500	30,000	.001267	.000267	0.	.....	
8,750	35,000	.001433	.000166	.....	.....	
9,500	38,000	.001633	.000200	.....	.....	
10,000	40,000	.001700	.000067	0.	.....	
11,250	45,000	.001933	.000233	.....	.....	
12,500	50,000	.002100	.000167	0.	.....	
13,750	55,000	.002333	.000233	.....	.....	
15,000	60,000	.002600	.000267	0.	.....	
16,250	65,000	.002733	.000133	0.	.....	
17,500	70,000	.003000	.000267	.000033	.000033	
18,750	75,000	.003300	.000300	.000033	0.	
20,000	80,000	.003600	.000300	.000100	.000067	
21,000	84,000	.003733	.000133	.....	.....	Elastic limit.
21,250	85,000	.004000	.000267	.000333	.000233	
22,000	88,000	.004267	.000267	.....	.....	
22,250	89,000	.004333	.000066	.....	.....	
22,500	90,000	.004567	.000234	.000667	.000334	
22,750	91,000	.004700	.000133	.....	.....	
23,000	92,000	.004900	.000200	.....	.....	
23,250	93,000	.005000	.000100	.....	.....	
23,500	94,000	.005300	.000300	.....	.....	
23,750	95,000	.005400	.000100	.....	.....	
24,000	96,000	.005733	.000333	.....	.....	
24,250	97,000	.006000	.000267	.....	.....	
24,500	98,000	.006500	.000500	.....	.....	
24,750	99,000	.006867	.000367	.....	.....	
25,000	100,000	.007400	.000533	.....	.....	
26,000	104,000	.0133	.0059	.....	.....	
27,000	108,000	.0233	.0100	.....	.....	
28,000	112,000	.0400	.0167	.....	.....	
29,000	116,000	.0600	.0200	.....	.....	
30,000	120,000	.0800	.0200	.....	.....	
31,000	124,000	.1067	.0267	.....	.....	
32,000	128,000	.1733	.0666	.....	.....	
32,710	130,840	.....	.....	.....	.....	Tensile strength.

General summary.

Specific gravity		8.0683
Hardness		31.30
Tensile strength per square inch of original section	pounds..	130,840
Elastic limit per square inch of original section	do...	84,000
Elongation per inch after rupture	inch..	.2533
Elongation per inch under strain at elastic limit	do...	.003733
Reduction in diameter at point of rupture	do...	.184
Reduction in area after rupture, per cent of original section		54.6
Position of rupture		".74 from neck
Character of broken surface		fine silky; cup-shaped ends; serrated radial lines
Elongation of inch sections		".12, ".19, ".45*

Chemical composition.

	Per cent.
Carbon	0.531
Manganese	0.813
Silicon	0.370
Sulphur	0.202
Phosphorus	0.026
Nickel	30.97

No. 4817.

Marks, U. S. N. 2.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133			
2,500	10,000	.000400	.000267			
5,000	20,000	.000833	.000433			
7,500	30,000	.001300	.000467			
10,000	40,000	.001667	.000367			
12,500	50,000	.002067	.000400	0.		
15,000	60,000	.002733	.000666			
17,000	68,000					Elastic limit (approximate).
17,500	70,000	.008400	.005667	.005333	.005333	
17,750	71,000	.009033	.000633			
18,000	72,000	.013000	.003967			
18,250	73,000	.014500	.001500			
18,500	74,000	.017333	.002833			
18,750	75,000	.020333	.003000			
19,000	76,000	.023333	.003000			
19,250	77,000	.025833	.002500			
19,500	78,000	.029000	.003167			
19,750	79,000	.031333	.002333			
20,000	80,000	.034733	.003400			
21,000	84,000	.0500	.015267			
22,000	88,000	.0667	.0167			
23,000	92,000	.0800	.0133			
24,000	96,000	.1000	.0200			
25,000	100,000	.1233	.0233			
26,000	104,000	.1500	.0267			
27,000	108,000	.1900	.0400			
27,920	111,680					Tensile strength.

General summary.

Specific gravity	8.0587
Hardness	20.14
Tensile strength per square inch of original section ..... pounds..	111,680
Elastic limit per square inch of original section (approximate) ..... do...	68,000
Elongation per inch after rupture ..... inch..	.3700
Reduction in diameter at point of rupture ..... do...	.254
Reduction in area after rupture, per cent of original section	70.0
Position of rupture	1″.05 from neck
Character of broken surface ..... conoidal end, presenting smooth surface of fracture of dull silvery luster.	
Elongation of inch sections	″.55*, ″.33, ″.23

Chemical composition.

	Per cent.
Carbon	0.513
Manganese	0.816
Silicon	0.383
Sulphur	0.176
Phosphorus	0.024
Nickel	30.22

REMARKS: During the tests of nickel steel specimens Nos. 4816 and 4817 after the elastic limit was passed there were periods of rigidity and relaxation alternating under increasing stresses, during the more rigid intervals the rate of elongation of the metal diminished, and then would follow intervals of more rapid rate of elongation, and this behavior was repeated under loads between the elastic limit and tensile strength.

STEEL FORGINGS

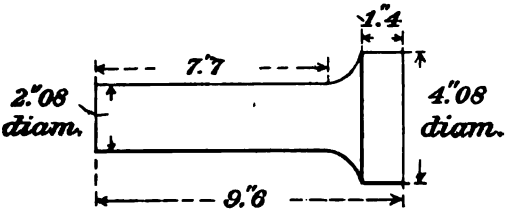
FROM

WATERTOWN ARSENAL.

STEEL FORGINGS FROM WATERTOWN ARSENAL.

TENSILE TEST OF A SPECIMEN FROM A MILD STEEL JOURNAL FORGING.

Shape of forging.



No. 5933.

LONGITUDINAL SPECIMEN.

Diameter, ″.505.
Sectional area, .20 square inch.
Length of stem, 2″.
Elastic limit, 9,620 pounds = 48,100 pounds per square inch.
Tensile strength, 12,610 pounds = 63,050 pounds per square inch.
Elongation in 2 inches, ″.62 = 31 per cent.
Elongation of inch sections, ″.33 *, ″.29.
Diameter at fracture, ″.34 ; area, .091 square inch.
Contraction of area, 54.5 per cent.
Appearance of fracture, silky.

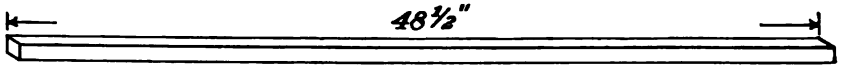
Chemical composition.

Carbon.			Manganese.	Silicon.	Sulphur.	Phosphorus.	Copper.
Total.	Graphitic.	Combined.					
0.128	0.008	0.120	0.232	0.120	0.025	0.039	0.000

HAMMERED STEEL BAR MADE FROM SCRAP.

TENSILE TEST.

No. 5934.



Sectional area, 1".02×1".03=1.05 square inches.
Elastic limit, 39,600 pounds=37,710 pounds per square inch.
Tensile strength, 56,610 pounds=53,910 pounds per square inch.
Elongation in 10 inches, 1".85=18.5 per cent.
Elongation of inch sections, ".21, ".20, ".21, ".20, ".19, ".19, ".18, ".17, ".15, ".15.
Area at fracture, ".76×".75=.570 square inch.
Contraction of area, 45.7 per cent.
Appearance of fracture, fibrous.

TRANSVERSE TEST.

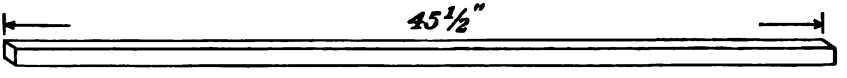
No. 5935.

Ends supported 12" apart.
Loaded at the middle.
Breadth, 1".03; depth, 1".02.
Ultimate strength, 7,180 pounds. R=120,780 pounds per square inch.
Bent 78 degrees. Fibrous fracture.

HAMMERED STEEL BAR MADE FROM OLD BAYONETS.

TENSILE TEST.

No. 5936.



Sectional area, 1".04×1".04=1.08 square inches.
Elastic limit, 46,900 pounds=43,420 pounds per square inch.
Tensile strength, 67,290 pounds=62,310 pounds per square inch.
Elongation in 10 inches, 2".16=21.6 per cent.
Elongation of inch sections, ".15, ".16, ".26, ".53*, ".22, ".18, ".19, ".19, ".16, ".12.
Area at fracture, ".81×".81=.656 square inch.
Contraction of area, 39.3 per cent.
Appearance of fracture, silky.

TRANSVERSE TEST.

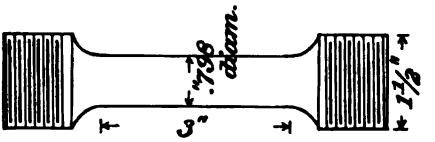
No. 5937.

Ends supported 12" apart.
Loaded at the middle.
Breadth, 1".04; depth, 1".04.
Ultimate strength, 9,360 pounds R=150,020 pounds per square inch.
Bent 110 degrees without fracture.

STEEL SPECIMEN FORGED DOWN FROM A STEEL BLOOM.

TENSION TEST.

No. 5973.

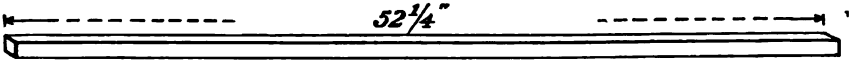


Sectional area, .50 square inch.
Elastic limit, 21,700 pounds=43,400 pounds per square inch.
Tensile strength, 32,310 pounds=64,620 pounds per square inch.
Elongation in 3 inches, ".96=32.0 per cent.
Elongation of inch sections, ".28, ".49*, ".19.
Diameter at fracture ".53; area, .221 square inch.
Contraction of area, 55.8 per cent.
Appearance of fracture, fine silky. Seam at center, ".2 wide.

STEEL BAR 0.58 CARBON WELDED UP FROM CRACKED BELLEVILLE SPRINGS.

TENSION TEST.

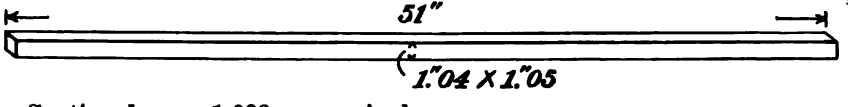
No. 5986.



Sectional area, 1".06 × 1".05 = 1.11 square inches.
Elastic limit, 69,930 pounds = 63,000 pounds per square inch.
Tensile strength, 119,410 pounds = 107,580 pounds per square inch.
Elongation in 30 inches, 3".11 = 10.4 per cent.
Elongation of inch sections, ".61, ".62, ".58, ".48, ".41, ".41.
Fractured outside the 30"-gauged section.
Appearance of fracture, fine granular, radiating from a seam $\frac{3}{16}$ deep at the middle of the width of one surface.

TENSION TEST OF A BAR WELDED UP OF WROUGHT IRON AND STEEL SCRAP.

No. 5884.



Sectional area, 1.092 square inches.
Elastic limit, 42,500 pounds = 38,920 pounds per square inch.
Tensile strength, 57,940 pounds = 53,060 pounds per square inch.
Elongation in 10 inches, 1".79 = 17.9 per cent.
Elongation of inch sections, ".42, ".23, ".15, ".16, ".16, ".17, ".12, ".15, ".13, ".10.
Area at fracture, ".78 × ".81 = .632 square inch.
Contraction of area, 42.1 per cent.
Appearance of fracture, fibrous.

HOT ROLLED STEEL BAR.

STEEL OF 0.74 CARBON, RECEIVED FOR TEMPERING SERIES OF TESTS.

SPECIMENS TAKEN FROM A $\frac{3}{4}$" BAR.

HOT ROLLED STEEL BARS.

No. 4917.

Diameter, ″.753.
Sectional area, .445 square inch.
Gauged length, 10″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
445	1,000	0.	0.	0.	0.	Initial load.
2,225	5,000	.00014	.00014	0.	.....	
4,450	10,000	.00030	.00016	.....	.....	
6,675	15,000	.00046	.00016	.....	.....	
8,900	20,000	.00063	.00017	.....	.....	
11,125	25,000	.00081	.00018	.....	.....	
13,350	30,000	.00100	.00019	.....	.....	
15,575	35,000	.00118	.00018	.....	.....	
17,800	40,000	.00133	.00015	.00005	.00005	
20,025	45,000	.00151	.00018	.....	.....	
22,250	50,000	.00170	.00019	.00011	.00006	
24,475	55,000	.00187	.00017	.....	.....	
26,700	60,000	.00201	.00014	.00010	.00001	
28,925	65,000	.00221	.00020	.....	.....	Elastic limit.
29,370	66,000	.00240	.00019	.....	.....	
29,815	67,000	.00353	.00113	.....	.....	
30,260	68,000	.00410	.00057	.....	.....	
30,705	69,000	.00443	.00033	.....	.....	
31,150	70,000	.00500	.00057	.....	.....	
32,040	72,000	.00572	.00072	.....	.....	
32,930	74,000	.00680	.00108	.....	.....	
33,820	76,000	.00770	.00090	.....	.....	
34,710	78,000	.00880	.00110	.....	.....	
35,600	80,000	.00970	.00090	.....	.....	
36,490	82,000	.01075	.00105	.....	.....	
37,380	84,000	.01170	.00095	.....	.....	
38,270	86,000	.01280	.00110	.....	.....	
39,160	88,000	.01390	.00110	.....	.....	
40,050	90,000	.01490	.00100	.....	.....	
40,940	92,000	.01610	.00120	.....	.....	
41,830	94,000	.01722	.00112	.....	.....	
42,720	96,000	.01840	.00118	.....	.....	
43,610	98,000	.01980	.00140	.....	.....	
44,500	100,000	.02110	.00130	.....	.....	
45,390	102,000	.022	.00090	.....	.....	
46,280	104,000	.023	.001	.....	.....	
47,170	106,000	.025	.002	.....	.....	
48,060	108,000	.027	.002	.....	.....	
48,950	110,000	.029	.002	.....	.....	
49,840	112,000	.030	.001	.....	.....	
50,730	114,000	.033	.003	.....	.....	
51,620	116,000	.035	.002	.....	.....	
52,510	118,000	.038	.003	.....	.....	
53,400	120,000	.042	.004	.....	.....	
54,290	122,000	.045	.003	.....	.....	
55,180	124,000	.049	.004	.....	.....	
56,070	126,000	.055	.006	.....	.....	
56,960	128,000	.062	.007	.....	.....	
57,850	130,000	.076	.014	.....	.....	
58,740	132,000	.098	.022	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	132,000
Elastic limit per square inch of original section	do...	65,000
Elongation per inch after rupture	inch..	.116
Elongation per inch under strain at elastic limit	do...	.00221
Reduction in diameter at point of rupture	do...	.063
Reduction in area after rupture, per cent of original section		16.0
Character of broken surface		fine silky
Elongation of inch sections		″.09, ″.11, ″.11, ″.11, ″.11, ″.11, ″.18*, ″.16, ″.09, ″.09

No. 4918.

Diameter, ″.753.
Sectional area, .445 square inch.
Gauged length, 10″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
445	1,000	0.	0.	0.	0.	Initial load.
2,225	5,000	.00014	.00014	0.	.....	
4,450	10,000	.00029	.00015	.....	.....	
6,675	15,000	.00046	.00017	.....	.....	
8,900	20,000	.00060	.00014	.....	.....	
11,125	25,000	.00078	.00018	.....	.....	
13,350	30,000	.00095	.00017	.....	.....	
15,575	35,000	.00110	.00005	.....	.....	
17,800	40,000	.00128	.00018	0.	.....	
20,025	45,000	.00148	.00020	.....	.....	
22,250	50,000	.00165	.00017	.....	.....	
24,475	55,000	.00179	.00014	.....	.....	
26,700	60,000	.00198	.00019	0.	.....	
27,145	61,000	.00200	.00002	.....	.....	
27,590	62,000	.00205	.00005	.....	.....	
28,035	63,000	.00208	.00003	.....	.....	
28,480	64,000	.00211	.00003	.....	.....	
28,925	65,000	.00219	.00008	.....	.....	Elastic limit.
29,370	66,000	.00300	.00011	.....	.....	
29,815	67,000	.00360	.00060	.....	.....	
30,260	68,000	.00415	.00055	.....	.....	
30,705	69,000	.00460	.00045	.....	.....	
31,150	70,000	.00503	.00043	.....	.....	
32,040	72,000	.00596	.00093	.....	.....	
32,930	74,000	.00690	.00094	.....	.....	
33,820	76,000	.00785	.00095	.....	.....	
34,710	78,000	.00890	.00105	.....	.....	
35,600	80,000	.00980	.00090	.....	.....	
36,490	82,090	.01070	.00090	.....	.....	
37,380	84,000	.01190	.00120	.....	.....	
28,270	86,000	.01290	.00100	.....	.....	
39,160	88,000	.01380	.00090	.....	.....	
40,050	90,000	.01490	.00110	.....	.....	
40,940	92,000	.01620	.00130	.....	.....	
41,830	94,000	.01720	.00100	.....	.....	
42,720	96,000	.01850	.00130	.....	.....	
43,610	98,000	.02000	.00150	.....	.....	
44,500	100,000	.02110	.00110	.....	.....	
45,390	102,000	.02280	.00170	.....	.....	
46,280	104,000	.02410	.00130	.01903	.01903	
47,170	106,000	.025	.00090	.....	.....	
48,060	108,000	.027	.002	.....	.....	
48,950	110,000	.029	.002	.....	.....	
49,840	112,000	.031	.002	.....	.....	
50,730	114,000	.034	.003	.....	.....	
51,620	116,000	.036	.002	.....	.....	
52,510	118,000	.039	.003	.....	.....	
53,400	120,000	.043	.004	.....	.....	
54,290	122,000	.045	.002	.....	.....	
55,180	124,000	.049	.004	.....	.....	
56,070	126,000	.055	.006	.....	.....	
56,960	128,000	.062	.007	.....	.....	
57,850	130,000	.075	.013	.....	.....	
58,740	132,000	.100	.025	.....	.....	Tenaile strength.

General summary.

Tenaile strength per square inch of original section	pounds..	132,000
Elastic limit per square inch of original section	do...	65,000
Elongation per inch after rupture	inch..	.110
Elongation per inch under strain at elastic limit	do...	.00219
Reduction in diameter at point of rupture	do...	.063
Reduction in area after rupture, per cent of original section		20.7
Character of broken surface		fine silky
Elongation of inch sections		″.09, ″.09, ″.10, ″.09, ″.11, ″.14, ″.20,* ″.11, ″.08, ″.10

STEEL SHAFTING

FROM

SPRINGFIELD ARMORY.

STEEL SHAFTING FROM SPRINGFIELD ARMORY.

No. 4781.

Mark, O.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000300	.000200	.....	.....	
5,000	20,000	.000667	.000367	.....	.....	
5,250	21,000	.000700	.000033	.....	.....	
5,500	22,000	.000767	.000067	.....	.....	Elastic limit.
5,750	23,000	.001000	.000233	.....	.....	
6,000	24,000	.007000	.006000	.....	.....	
6,250	25,000	.008300	.001300	.007400	.007400	
6,500	26,000	.010233	.001933	.....	.....	
6,750	27,000	.011000	.000767	.....	.....	
7,000	28,000	.012333	.001333	.....	.....	
7,250	29,000	.014000	.001667	.....	.....	
7,500	30,000	.016000	.002000	.....	.....	
8,000	32,000	.020267	.004267	.....	.....	
8,500	34,000	.024333	.004066	.....	.....	
9,000	36,000	.029167	.004834	.....	.....	
9,500	38,000	.034333	.005166	.....	.....	
10,000	40,000	.040000	.005667	.....	.....	
10,500	42,000	.047333	.007333	.....	.....	
11,000	44,000	.056000	.008667	.....	.....	
11,500	46,000	.0667	.0107	.....	.....	
12,000	48,000	.0800	.0133	.....	.....	
12,500	50,000	.1033	.0233	.....	.....	
13,000	52,000	.1367	.0334	.....	.....	
13,500	54,000	.2533	.1166	.....	.....	
13,510	54,040	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	54,040
Elastic limit per square inch of original section	do...	22,000
Elongation per inch after rupture	inch..	.3533
Elongation per inch under strain at elastic limit	do...	.000767
Reduction in diameter at point of rupture	do...	.184
Reduction in area after rupture, per cent of original section		54.6
Position of rupture		2″ from neck
Character of broken surface		silky
Elongation of inch sections		″.25, ″.56*, ″.25

No. 4782.

Mark, 1.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

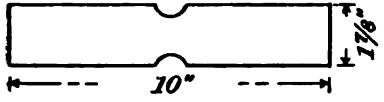
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100			
2,500	10,000	.000300	.000200			
3,750	15,000	.000467	.000167			
5,000	20,000	.000633	.000166	0.		
5,250	21,000	.000700	.000067			Elastic limit.
5,500	22,000	.000933	.000233			
5,750	23,000	.005333	.004400			
6,000	24,000	.006933	.001600			
6,250	25,000	.007667	.000734			
6,500	26,000	.009333	.001666			
6,750	27,000	.010267	.000934			
7,000	28,000	.011867	.001600			
7,250	29,000	.013333	.001466			
7,500	30,000	.015833	.002500			
8,000	32,000	.019000	.003167			
8,500	34,000	.023000	.004000			
9,000	36,000	.028000	.005000			
9,500	38,000	.033167	.005167			
10,000	40,000	.038667	.005500			
10,500	42,000	.046667	.008000			
11,000	44,000	.054667	.008000			
11,500	46,000	.063333	.008666			
12,000	48,000	.075000	.001667			
12,500	50,000	.095000	.020000			
13,000	52,000	.126667	.031667			
13,500	54,000	.2000	.073333			Tensile strength.

General summary.

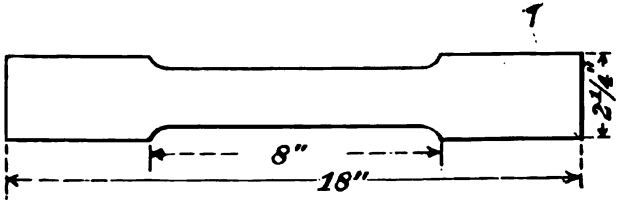
Tensile strength per square inch of original section	pounds..	54,000
Elastic limit per square inch of original section	do...	21,000
Elongation per inch after rupture	inch..	.2933
Elongation per inch under strain at elastic limit	do...	.000700
Reduction in diameter at point of rupture	do...	.144
Reduction in area after rupture, per cent of original section		44.6
Position of rupture		1″.30 from neck
Character of broken surface		silky, containing a spot of light-colored metal ″.12 diameter
Elongation of inch sections		″.30*, ″.37*, ″.31

BOILER-PLATE STEEL FROM WATERVLIET ARSENAL.

Form of specimens Nos. 5783 to 5791.



Form of specimens Nos. 5867 to 5869.



No. of test.	Mark on specimen.	Dimensions.		Sectional area.	Elastic limit.		Tensile strength.		Elongation in 8 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.	Elongation of inch sections.
		Width.	Thickness.		Total.	Per square inch.	Total.	Per square inch.	Inches.	Per cent.				
		Inches.	*Inch.*	*Sq. in.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*			*Inches. Sq. in.*	*Per ct.*		
5783	1	1.00	.424	.424	.....	.....	24,970	58,890	.....	.....	.83×.24=.199	53.1	Silky	
5784	2	1.00	.434	.434	.....	.....	25,290	58,270	.....	.....	.82×.23=.189	56.5	.....do	
5785	3	1.00	.447	.447	.....	.....	25,810	57,740	.....	.....	.82×.23=.189	57.7	.....do	
5786	4	1.00	.411	.411	.....	.....	24,650	59,970	.....	.....	.85×.22=.187	54.5	.....do	
5787	5	1.00	.429	.429	.....	.....	24,160	56,320	.....	.....	.78×.23=.179	58.3	.....do	
5788	6	1.00	.440	.440	.....	.....	24,995	56,810	.....	.....	.79×.23=.182	58.6	.....do	
5789	7	1.00	.438	.438	.....	.....	25,280	57,720	.....	.....	.83×.22=.183	58.2	.....do	
5790	8	1.00	.426	.426	.....	.....	24,880	58,400	.....	.....	.83×.22=.183	57.1	.....do	
5791	9	1.00	.422	.422	.....	.....	24,470	57,990	.....	.....	.83×.22=.183	56.6	.....do	
														" " " " " " " "
5867	Dome 1	1.496	.370	.553	20,250	36,620	29,170	52,750	2.08	26.0	1.08×.21=.227	58.9	.....do	.12, .19, .24, .72*, .28, .23, .18, .12
5868	Dome 2	1.495	.377	.564	21,100	37,410	32,050	56,830	2.09	26.1	1.11×.23=.255	54.8	.....do	.12, .25, .22, .27, .65*, .27, .20, .11
5869	Dome 3	1.497	.370	.554	19,980	36,060	29,060	52,450	1.99	24.9	1.10×.20=.220	60.3	Silky, slightly lamellar.	.13, .60*, .36, .22, .19, .19, .20, .10

BRONZE AND BRASS.

BRASS FROM WATERVLIET ARSENAL.

No. of test.	Mark.	Diameter.	Sectional area.	Tensile strength.		Appearance of fractures.
				Total.	Per square inch.	
		Inch.	*Sq. in.*	*Pounds.*	*Pounds.*	
5,971	4	.7975	.50	12,750	25,500	Light yellow color.
5,972	5	.7975	.50	11,475	22,950	Both fractured in the threads.

Composition.

No. of test.	Mark.	Copper.	Tin.	Zinc.
5,971	4	76.00	0.00	24.25
5,972	5	75.50	0.00	24.49

Brass from Watertown Arsenal Foundry.

No. 4851.

Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
500	2,000	.000067	.000067	.....	.....	
750	3,000	.000167	.000100	.....	.....	
1,000	4,000	.000267	.000100	.....	.....	
1,250	5,000	.000333	.000066	0.	.....	
1,500	6,000	.000400	.000067	.....	.....	
1,750	7,000	.000467	.000067	.....	.....	
2,000	8,000	.000600	.000133	.....	.....	
2,250	9,000	.000700	.000100	.....	.....	
2,500	10,000	.000767	.000067	0.	.....	
2,750	11,000	.000833	.000066	.....	.....	
3,000	12,000	.000967	.000134	.....	.....	
3,250	13,000	.001033	.000066	.....	.....	
3,500	14,000	.001133	.000100	.....	.....	
3,750	15,000	.001300	.000167	.000033	.000033	
4,000	16,000	.001400	.000100	.....	.....	Elastic limit.
4,250	17,000	.001600	.000200	.....	.....	
4,500	18,000	.001800	.000200	.....	.....	
4,750	19,000	.002033	.000233	.....	.....	
5,000	20,000	.002433	.000400	.000600	.000567	
5,250	21,000	.002867	.000434	.....	.....	
5,500	22,000	.003633	.000766	.....	.....	
5,750	23,000	.004133	.000500	.....	.....	
6,000	24,000	.005567	.001434	.....	.....	
6,250	25,000	.006333	.000766	.003633	.003033	
6,500	26,000	.008033	.001700	.....	.....	
6,750	27,000	.009767	.001734	.....	.....	
7,000	28,000	.012400	.002633	.....	.....	
7,250	29,000	.013733	.001333	.....	.....	
7,500	30,000	.018033	.004300	.014433	.010800	
7,590	30,360	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	30,360
Elastic limit per square inch of original section	do...	16,000
Elongation per inch after rupture	inch..	.0267
Elongation per inch under strain at elastic limit	do...	.001400
Reduction in diameter at point of rupture	do...	.024
Reduction in area after rupture, per cent of original section		8.4
Position of rupture		1″.5 from neck
Character of broken surface		light-yellow metal, in part lavender color
Elongation of inch sections		″.01, ″.05*, .02

Composition.

	Per cent.
Cu	57.22
Sn	0.34
Zn	42.40

REMELT OF METAL USED IN TEST NO. 4851.

No. 4854.

Mark, 3.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
500	2,000	.000067	.000067	.....	.....	
750	3,000	.000133	.000066	.....	.....	
1,000	4,000	.000267	.000134	.....	.....	
1,250	5,000	.000333	.000066	0.	.....	
1,500	6,000	.000400	.000067	.....	.....	
1,750	7,000	.000467	.000067	.....	.....	
2,000	8,000	.000600	.000133	.....	.....	
2,250	9,000	.000667	.000067	.....	.....	
2,500	10,000	.000767	.000100	0.	.....	
2,750	11,000	.000800	.000033	.....	.....	
3,000	12,000	.000967	.000167	.....	.....	
3,250	13,000	.001033	.000066	.....	.....	
3,500	14,000	.001200	.000167	.....	.....	
3,750	15,000	.001267	.000067	.000033	.000033	
4,000	16,000	.001367	.000100	.....	.....	
4,250	17,000	.001467	.000100	.....	.....	
4,500	18,000	.001733	.000266	.....	.....	
4,750	19,000	.001867	.000134	.....	.....	Elastic limit.
5,000	20,000	.002267	.000400	.000400	.000367	
5,250	21,000	.002400	.000133	.....	.....	
5,500	22,000	.002867	.000467	.....	.....	
5,750	23,000	.003333	.000466	.....	.....	
6,000	24,000	.004300	.000967	.....	.....	
6,250	25,000	.004933	.000633	.002133	.001733	
6,500	26,000	.005367	.000434	.....	.....	
6,750	27,000	.007033	.001666	.....	.....	
7,000	28,000	.008700	.001667	.....	.....	
7,250	29,000	.010333	.001633	.....	.....	
7,500	30,000	.012333	.002000	.009000	.006867	
7,750	31,000	.013167	.000834	.....	.....	
8,000	32,000	.014000	.000833	.....	.....	
8,250	33,000	.018500	.004500	.....	.....	
8,500	34,000	.023333	.004833	.....	.....	
8,750	35,000	.025567	.002234	.021300	.012300	
9,000	36,000	.027833	.002266	.....	.....	
9,250	37,000	.032333	.004500	.....	.....	
9,500	38,000	.036333	.004000	.....	.....	Surface cracks develop.
9,750	39,000	.037500	.001167	.....	.....	
10,000	40,000	.043000	.005500	.038267	.016967	
10,250	41,000	.046333	.003333	.....	.....	
10,500	42,000	.052667	.006334	.....	.....	
10,750	43,000	.055500	.002833	.....	.....	
11,000	44,000	.062000	.006500	.....	.....	
11,250	45,000	.066000	.004000	.060300	.022033	
11,420	45,680	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	45,680
Elastic limit per square inch of original section	do...	19,000
Elongation per inch after rupture	inch..	.0800
Elongation per inch under strain at elastic limit	do...	.001867
Reduction in diameter at point of rupture	do...	.044
Reduction in area, after rupture, per cent of original section		15.0
Position of rupture		1″.6 from neck
Character of broken surface		lavender color, with stripe of yellow colored metal
Elongation of inch sections		″06, ″.11, ″.07

Composition.

	Per cent.
Cu	56.66
Cu	0.34
Zn	43.06

BRASS.

Two specimens taken from a slab about 7″ by 7″ by $1\frac{3}{16}$″ cast at Watertown Arsenal Foundry.

No. 4872

Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
500	2,000	.000067	.000067	.....	.....	
750	3,000	.000167	.000100	.....	.....	
1,000	4,000	.000267	.000100	.....	.....	
1,250	5,000	.000367	.000100	.000067	.000067	Elastic limit.
1,500	6,000	.000633	.000266	.....	.....	
1,750	7,000	.001167	.000534	.....	.....	
2,000	8,000	.004833	.003666	.....	.....	
2,250	9,000	.007000	.002167	.....	.....	
2,500	10,000	.026333	.019333	.....	.....	Crack opens in stem.
3,410	13,640	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	13,640
Elastic limit per square inch of original section	do...	5,000
Elongation per inch after rupture	inch..	.0600
Elongation per inch under strain at elastic limit	do...	.000367
Reduction in diameter at point of rupture	do...	.044
Reduction in area after rupture, per cent of original section		15.0
Position of rupture		″.55 from neck
Character of broken surface.....	light yellow color. At one side the metal was dark brown color, comprising 30 per cent of surface. The metal first separated at this dark-colored section.	

No. 4873.

Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
500	2,000	.000067	.000067			
750	3,000	.000200	.000133			
1,000	4,000	.000300	.000100			
1,250	5,000	.000367	.000067	.000033	.000033	Elastic limit.
1,500	6,000	.000700	.000333			
1,750	7,000	.002000	.001300			
2,000	8,000	.004333	.002333			
2,250	9,000	.011067	.006734			
2,500	10,000	.032333	.021266	.031033	.031000	
2,750	11,000	.043000	.010667			
3,000	12,000	.066333	.023333			
3,250	13,000	.0833	.0167			
3,500	14,000	.1000	.0167			
3,750	15,000	.1133	.0133			
4,000	16,000	.1300	.0167			
4,250	17,000	.1433	.0133			
4,500	18,000	.1633	.0200			
4,750	19,000	.1767	.0134			
5,000	20,000	.2000	.0233			
5,250	21,000	.2133	.0133			
5,500	22,000	.2367	.0234			
5,750	23,000	.2533	.0166			
6,000	24,000	.2800	.0267			
6,250	25,000	.3000	.0200			
6,500	26,000	.3433	.0433			
6,750	27,000	.3733	.0300			
6,810	27,240					Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	27,240
Elastic limit per square inch of original section	do...	5,000
Elongation per inch after rupture	inch..	.4000
Elongation per inch under strain at elastic limit	do...	.000367
Reduction in diameter at point of rupture	do...	.144
Reduction in area after rupture, per cent of original section		44.6
Position of rupture		″.85 from neck
Character of broken surface		light yellow
Elongation of inch sections		″.37, ″.35, ″.48*

Composition.

	Per cent.
Cu	79.90
Sn	2.12
Zn	17.92

Brass Mixture Cast at Watertown Arsenal Foundry.

No. 4855.

Marks, B B_3.
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
500	2,000	.000067	.000067	.....	.....	
750	3,000	.000133	.000066	.....	.....	
1,000	4,000	.000300	.000167	.....	.....	
1,250	5,000	.000367	.000067	0.	.....	
1,500	6,000	.000533	.000066	.....	.....	
1,750	7,000	.000767	.000234	.....	.....	Elastic limit.
2,000	8,000	.001767	.001000	.....	.....	
2,250	9,000	.004167	.002400	.....	.....	
2,500	10,000	.011667	.007500	.011167	.011167	
2,750	11,000	.023667	.012000	.....	.....	
3,000	12,000	.043333	.019666	.....	.....	Surface cracks develop.
3,250	13,000	.058333	.015000	.....	.....	
3,500	14,000	.0800	.021667	.....	.....	
3,750	15,000	.0933	.0133	.....	.....	
4,000	16,000	.1200	.0267	.....	.....	
4,250	17,000	.1300	.0100	.....	.....	
4,500	18,000	.1533	.0233	.....	.....	
4,750	19,000	.1667	.0134	.....	.....	
5,000	20,000	.1867	.0200	.....	.....	
5,250	21,000	.2000	.0133	.....	.....	
5,500	22,000	.2200	.0200	.....	.....	
5,750	23,000	.2367	.0167	.....	.....	
6,000	24,000	.2633	.0266	.....	.....	
6,250	25,000	.2767	.0134	.....	.....	
6,500	26,000	.3067	.0300	.....	.....	
6,750	27,000	.3300	.0233	.....	.....	
7,000	28,000	.3667	.0367	.....	.....	
7,250	29,000	.3967	.0300	.....	.....	
7,480	29,920	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	29,920
Elastic limit per square inch of original section	do...	7,000
Elongation per inch after rupture	inch..	.4567
Elongation per inch under strain at elastic limit	do...	.000767
Reduction in diameter at point of rupture	do...	.114
Reduction in area after rupture, per cent of original section		36.4
Position of rupture		1".26 from neck
Character of broken surface		uniform lemon yellow color
Elongation of inch sections		".41, ".42, ".54*

Composition.

	Per cent.
Cu	74.24
Sn	0.50
Zn	25.30

GUN METAL CAST AT WATERTOWN ARSENAL FOUNDRY.

No. 4853.

Marks, G M 1.
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
500	2,000	.000033	.000033	.....	.....	
750	3,000	.000133	.000100	.....	.....	
1,000	4,000	.000333	.000200	.....	.....	
1,250	5,000	.000400	.000067	0.	.....	
1,500	6,000	.000567	.000167	.....	.....	
1,750	7,000	.000633	.000066	.....	.....	
2,000	8,000	.000767	.000134	.....	.....	
2,250	9,000	.000900	.000133	.....	.....	
2,500	10,000	.001067	.000167	.000067	.000067	Elastic limit.
2,750	11,000	.001367	.000300	.....	.....	
3,000	12,000	.001733	.000366	.....	.....	
3,250	13,000	.002400	.000667	.....	.....	
3,500	14,000	.004000	.001600	.....	.....	
3,750	15,000	.005833	.001833	.004300	.004233	
4,000	16,000	.010267	.004434	.....	.....	
4,250	17,000	.014333	.004066	.....	.....	Surface cracks develop.
4,500	18,000	.023333	.009000	.....	.....	
4,750	19,000	.033000	.009667	.....	.....	
4,790	19,160	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	19,160
Elastic limit per square inch of original section	do...	10,000
Elongation per inch after rupture	inch..	.0633
Elongation per inch under strain at elastic limit	do...	.001067
Reduction in diameter at point of rupture	do...	.024
Reduction in area after rupture, per cent of original section		8.4
Position of rupture		1".3 from neck
Character of broken surface		Irregular vesicular surface. Color varies from light yellow to dark copper color.
Elongation of inch sections		".03, ".13*, ".03

Composition.

	Per cent.
Cu	87.30
Sn	10.50
Zn	2.68

Brass Breech Plate for 12″ B. L. Steel Rifle.

No. 4888.

Remelted brass. Specimen from runner.

Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 2″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
500	2,000	.00005	.00005	.....	.....	
750	3,000	.00010	.00005	.....	.....	
1,000	4,000	.00015	.00005	.....	.....	
1,250	5,000	.00020	.00005	.....	.....	
1,500	6,000	.00030	.00010	.....	.....	
1,750	7,000	.00045	.00015	.....	.....	
2,000	8,000	.00055	.00010	.....	.....	
2,250	9,000	.00060	.00005	.....	.....	
2,500	10,000	.00080	.00020	0.	.....	
2,750	11,000	.00090	.00010	.....	.....	
3,000	12,000	.00100	.00010	.....	.....	
3,250	13,000	.00110	.00010	.....	.....	
3,500	14,000	.00130	.00020	.....	.....	Elastic limit, not well defined.
3,750	15,000	.00145	.00015	.00010	.00010	
4,000	16,000	.00165	.00020	.....	.....	
4,250	17,000	.00195	.00030	.....	.....	
4,500	18,000	.00220	.00025	.....	.....	
4,750	19,000	.00235	.00015	.....	.....	
5,000	20,000	.00265	.00030	.00065	.00055	
5,250	21,000	.00300	.00035	.....	.....	
5,500	22,000	.00320	.00020	.....	.....	
5,750	23,000	.00345	.00025	.....	.....	
6,000	24,000	.00400	.00055	.....	.....	
6,250	25,000	.00430	.00030	.00165	.00100	
6,500	26,000	.00485	.00055	.....	.....	
6,750	27,000	.00540	.00055	.....	.....	
7,000	28,000	.00605	.00065	.....	.....	
7,250	29,000	.00695	.00090	.....	.....	
7,500	30,000	.00790	.00095	.00450	.00285	
7,750	31,000	.00900	.00110	.....	.....	
8,000	32,000	.01050	.00150	.....	.....	
8,250	33,000	.01175	.00125	.....	.....	
8,500	34,000	.01430	.00255	.....	.....	
8,750	35,000	.01595	.00165	.....	.....	
9,000	36,000	.01855	.00260	.....	.....	
9,500	38,000	.02440	.00585	.....	.....	
10,000	40,000	.03165	.00725	.....	.....	
10,500	42,000	.03950	.00785	.....	.....	
11,000	44,000	.04960	.01010	.....	.....	
11,500	46,000	.05900	.00940	.....	.....	
12,000	48,000	.07100	.01200	.....	.....	
12,500	50,000	.08250	.01150	.....	.....	
13,000	52,000	.09950	.01700	.....	.....	
13,020	52,080	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	52,080
Elastic limit per square inch of original section (not well defined)	do...	14,000
Elongation per inch after rupture	inch..	.1100
Elongation per inch under strain at elastic limit	do...	.00130
Reduction in diameter at point of rupture	do...	.054
Reduction in area after rupture, per cent of original section		18.3
Position of rupture		″.70 from neck
Character of broken surface		light-yellow color
Elongation of inch sections		″.13″, ″.09

Composition.

	Per cent.
Cu	55.0
Zn	44.5
Sn	.5

TABULATION OF BRASS AND BRONZE FROM WATERTOWN ARSENAL FOUNDRY.

No. of test.	Chemical composition.			Diameter.	Sectional area.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation in 8 inches.	Contraction of area.	Appearance of fracture.	Elongation of inch sections.
	Cu.	Sn.	Zn.								
				Inch.	*Sq. inch.*	*Pounds.*	*Pounds.*	*Per cent.*	*Per cent.*		
4851	57.22	0.34	42.40	.564	.25	16,000	30,360	2.7	8.4	Light yellow, in part lavender color	".01, ".05*, ".02
a 4854	56.66	0.34	43.06	.564	.25	19,000	45,680	8.0	15	Lavender color, with strips of yellow-colored metal	.06, .11*, .07
b 4872	.....	.....	.....	.564	.25	5,000	13,640	6.0	15	Light yellow, dark brown on one side	.....
b 4873	79.90	2.12	17.92	.564	.25	5,000	27,240	40.0	44.6	Light-yellow color	".37, ".35, ".48*
4855	74.24	0.50	25.30	.564	.25	7,000	29,920	45.7	36.4	Uniform lemon-yellow color	.41, .42, .54*
4858	87.30	10.50	2.68	.564	.25	10,000	19,160	6.8	8.4	Irregular vesicular surface. Color varies from light yellow to dark copper color	.03, .13*, .03
4888	55.0	0.5	44.5	.564	.25	c 14,000	52,080	d 11.0	18.3	Light-yellow color	".13*, ".09

a Remelt of metal used in test No. 4851. b From same slab of metal. c Approximate. d Elongation in 2 inches.

COMPRESSION OF COPPER CYLINDERS

FOR USE WITH

CRUSHER GAUGES.

COMPRESSION OF COPPER CYLINDERS FOR USE WITH CRUSHER GAUGES.

No. 5873.

Mean compression of ten copper cylinders from lot of 100 pounds received at Frankfort Arsenal, January, 1890, and annealed June, 1892. For use in crusher gauge $\frac{1}{10}$ square-inch area.

Mean dimensions of ten cylinders: Length, ".4997; diameter, ".2510.

Table for use in experiments with small-arm ammunition.

Load per square inch on crusher gauge $\frac{1}{10}$ square inch area.	Total compression.											Mean corrected sets.
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	Mean.	
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
1,000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	------
2,500	.0001	0.	.0002	.0001	.0002	.0004	.0001	.0002	.0001	.0004	.0002	.0002
3,000	.0002	.0001	.0002	.0001	.0004	.0004	.0001	.0004	.0002	.0004	.0003	.0003
3,500	.0003	.0001	.0006	.0002	.0005	.0005	.0001	.0004	.0004	.0006	.0004	.0004
4,000	.0007	.0003	.0007	.0004	.0007	.0006	.0003	.0009	.0006	.0010	.0006	.0006
4,500	.0010	.0007	.0011	.0006	.0012	.0015	.0007	.0013	.0011	.0015	.0011	.0011
5,000	.0020	.0015	.0023	.0020	.0020	.0024	.0019	.0025	.0021	.0026	.0021	.0021
5,500	.0033	.0028	.0035	.0025	.0034	.0046	.0028	.0036	.0036	.0041	.0034	.0033
6,000	.0049	.0041	.0050	.0039	.0052	.0065	.0041	.0050	.0050	.0056	.0049	.0048
6,500	.0067	.0060	.0065	.0056	.0069	.0078	.0059	.0070	.0066	.0073	.0066	.0064
7,000	.0081	.0078	.0084	.0072	.0084	.0096	.0076	.0086	.0085	.0090	.0083	.0081
7,500	.0099	.0096	.0106	.0090	.0103	.0115	.0092	.0105	.0103	.0109	.0102	.0099
8,000	.0120	.0116	.0120	.0110	.0121	.0135	.0108	.0120	.0120	.0127	.0120	.0117
8,500	.0138	.0135	.0140	.0126	.0146	.0161	.0130	.0140	.0137	.0148	.0140	.0136
9,000	.0157	.0156	.0160	.0145	.0159	.0175	.0151	.0165	.0163	.0171	.0160	.0155
9,500	.0182	.0176	.0181	.0180	.0177	.0194	.0171	.0181	.0185	.0191	.0182	.0177
10,000	.0200	.0190	.0205	.0185	.0202	.0214	.0193	.0201	.0210	.0218	.0202	.0197
10,500	.0221	.0219	.0228	.0209	.0225	.0238	.0216	.0230	.0232	.0245	.0226	.0221
11,000	.0241	.0241	.0247	.0230	.0244	.0260	.0239	.0246	.0250	.0258	.0246	.0240
11,500	.0261	.0265	.0267	.0249	.0265	.0280	.0260	.0265	.0274	.0283	.0267	.0261
12,000	.0285	.0285	.0295	.0276	.0287	.0305	.0282	.0285	.0300	.0302	.0290	.0283
12,500	.0311	.0311	.0315	.0296	.0311	.0325	.0310	.0314	.0320	.0331	.0314	.0307
13,000	.0334	.0334	.0338	.0315	.0335	.0350	.0328	.0335	.0345	.0354	.0337	.0329
13,500	.0356	.0358	.0362	.0345	.0360	.0375	.0355	.0360	.0371	.0381	.0362	.0354
14,000	.0382	.0381	.0386	.0376	.0383	.0395	.0378	.0375	.0390	.0399	.0384	.0375
14,500	.0407	.0409	.0407	.0389	.0406	.0430	.0404	.0395	.0416	.0425	.0409	.0400
15,000	.0430	.0434	.0430	.0416	.0441	.0448	.0423	.0430	.0439	.0450	.0434	.0424
15,500	.0456	.0455	.0465	.0444	.0459	.0470	.0449	.0465	.0462	.0475	.0460	.0450
16,000	.0481	.0480	.0482	.0470	.0479	.0496	.0473	.0481	.0510	.0500	.0485	.0474
16,500	.0506	.0504	.0512	.0490	.0525	.0521	.0501	.0501	.0520	.0525	.0500	.0489
17,000	.0531	.0531	.0534	.0511	.0533	.0546	.0525	.0526	.0540	.0554	.0533	.0522
17,500	.0560	.0561	.0558	.0546	.0560	.0570	.0552	.0560	.0574	.0585	.0563	.0552
18,000	.0584	.0587	.0580	.0573	.0581	.0595	.0575	.0577	.0594	.0586	.0583	.0572
18,200	.0595	.0595	.0591	.0577	.0596	.0606	.0589	.0590	.0606	.0588	.0593	.0582
18,400	.0602	.0610	.0602	.0585	.0608	.0620	.0595	.0610	.0619	.0595	.0605	.0594
18,600	.0612	.0618	.0617	.0594	.0621	.0635	.0604	.0616	.0628	.0606	.0615	.0604
18,800	.0623	.0624	.0627	.0605	.0632	.0645	.0619	.0622	.0637	.0616	.0625	.0614
19,000	.0632	.0630	.0635	.0615	.0643	.0654	.0631	.0632	.0652	.0631	.0635	.0624
19,200	.0646	.0647	.0644	.0625	.0647	.0664	.0641	.0642	.0660	.0642	.0646	.0635
19,400	.0657	.0657	.0651	.0640	.0655	.0673	.0649	.0652	.0669	.0648	.0655	.0644
19,600	.0669	.0670	.0662	.0651	.0668	.0688	.0660	.0663	.0675	.0657	.0666	.0655
19,800	.0677	.0680	.0675	.0657	.0676	.0697	.0667	.0675	.0684	.0672	.0676	.0665
20,000	.0688	.0690	.0682	.0666	.0689	.0706	.0682	.0686	.0699	.0684	.0687	.0676
20,200	.0698	.0699	.0692	.0676	.0703	.0718	.0696	.0695	.0711	.0691	.0698	.0687
20,400	.0710	.0720	.0705	.0690	.0712	.0728	.0705	.0706	.0725	.0702	.0710	.0699
20,600	.0721	.0728	.0720	.0704	.0725	.0737	.0709	.0716	.0735	.0716	.0721	.0710
20,800	.0732	.0735	.0731	.0715	.0734	.0747	.0715	.0725	.0745	.0727	.0731	.0720
21,000	.0740	.0742	.0740	.0723	.0740	.0760	.0725	.0736	.0758	.0740	.0740	.0729
21,200	.0754	.0749	.0749	.0734	.0755	.0781	.0739	.0745	.0769	.0748	.0752	.0741
21,400	.0770	.0759	.0760	.0745	.0770	.0791	.0754	.0759	.0779	.0759	.0765	.0754
21,600	.0781	.0774	.0770	.0754	.0785	.0799	.0764	.0770	.0790	.0770	.0776	.0765
21,800	.0790	.0785	.0785	.0768	.0791	.0806	.0777	.0780	.0808	.0782	.0787	.0776
22,000	.0801	.0797	.0798	.0779	.0801	.0815	.0784	.0789	.0808	.0795	.0797	.0786
22,200	.0811	.0809	.0806	.0791	.0815	.0828	.0797	.0805	.0809	.0804	.0808	.0797
22,400	.0824	.0820	.0815	.0810	.0830	.0835	.0809	.0821	.0810	.0816	.0819	.0808
22,600	.0832	.0829	.0825	.0825	.0836	.0846	.0825	.0860	.0811	.0825	.0831	.0820

No. 5873—Continued.

Load per square inch on crusher gauge $\frac{1}{10}$ square inch area.	Total compression.											Mean corrected sets.
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	Mean.	
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
22,800	.0849	.0841	.0835	.0831	.0843	.0860	.0838	.0860	.0816	.0836	.0841	.0830
23,000	.0860	.0856	.0848	.0833	.0860	.0875	.0849	.0860	.0829	.0850	.0852	.0841
23,200	.0871	.0870	.0860	.0835	.0861	.0885	.0861	.0861	.0850	.0861	.0862	.0851
23,400	.0885	.0880	.0875	.0835	.0865	.0886	.0871	.0861	.0865	.0874	.0870	.0859
23,600	.0896	.0891	.0876	.0837	.0866	.0889	.0877	.0862	.0880	.0886	.0876	.0865
23,800	.0908	.0902	.0877	.0840	.0870	.0892	.0880	.0864	.0890	.0897	.0882	.0871
24,000	.0915	.0917	.0880	.0846	.0880	.0896	.0893	.0869	.0899	.0905	.0890	.0878
24,200	.0926	.0928	.0883	.0870	.0895	.0904	.0899	.0879	.0906	.0920	.0901	.0889
24,400	.0939	.0942	.0896	.0881	.0910	.0915	.0925	.0893	.0920	.0931	.0915	.0903
24,600	.0950	.0953	.0906	.0897	.0915	.0927	.0925	.0901	.0924	.0940	.0924	.0912
24,800	.0961	.0965	.0924	.0907	.0935	.0945	.0925	.0912	.0944	.0949	.0937	.0925
25,000	.0979	.0971	.0975	.0916	.0946	.0961	.0925	.0926	.0969	.0961	.0949	.0937
25,200	.0988	.0985	.0950	.0930	.0960	.0974	.0930	.0940	.0980	.0976	.0961	.0949
25,400	.0995	.0995	.0965	.0949	.0969	.0982	.0940	.0955	.0989	.0987	.0973	.0961
25,600	.1006	.1010	.0973	.0957	.0980	.0996	.0951	.0974	.0997	.1000	.0984	.0972
25,800	.1021	.1021	.0985	.0970	.0990	.1010	.0970	.0983	.1005	.1013	.0997	.0985
26,000	.1040	.1033	.0998	.0976	.1002	.1020	.0984	.0991	.1022	.1025	.1009	.0997
26,200	.1054	.1044	.1009	.0985	.1018	.1030	.0994	.1000	.1031	.1036	.1020	.1008
26,400	.1060	.1057	.1020	.0994	.1030	.1040	.1006	.1011	.1039	.1047	.1030	.1018
26,600	.1068	.1070	.1030	.1005	.1042	.1047	.1019	.1023	.1050	.1059	.1041	.1029
26,800	.1075	.1081	.1040	.1030	.1055	.1059	.1030	.1034	.1061	.1071	.1054	.1042
27,000	.1086	.1090	.1050	.1041	.1064	.1075	.1042	.1045	.1080	.1085	.1066	.1054
27,200	.1101	.1101	.1061	.1050	.1071	.1088	.1054	.1059	.1090	.1097	.1077	.1065
27,400	.1110	.1115	.1071	.1060	.1082	.1099	.1066	.1074	.1097	.1106	.1088	.1076
27,600	.1125	.1130	.1081	.1072	.1095	.1110	.1077	.1089	.1107	.1118	.1100	.1088
27,800	.1132	.1146	.1095	.1081	.1111	.1121	.1093	.1098	.1120	.1130	.1113	.1101
28,000	.1151	.1155	.1115	.1090	.1128	.1133	.1106	.1118	.1138	.1144	.1128	.1116
28,200	.1162	.1166	.1129	.1101	.1138	.1142	.1117	.1125	.1145	.1152	.1138	.1126
28,400	.1177	.1178	.1138	.1117	.1148	.1154	.1127	.1135	.1155	.1166	.1149	.1137
28,600	.1191	.1190	.1142	.1124	.1157	.1170	.1139	.1146	.1168	.1177	.1160	.1148
28,800	.1200	.1201	.1155	.1136	.1174	.1180	.1155	.1160	.1181	.1190	.1173	.1161
29,000	.1214	.1211	.1168	.1152	.1189	.1190	.1165	.1169	.1198	.1202	.1186	.1174
29,200	.1224	.1222	.1179	.1166	.1190	.1205	.1171	.1179	.1210	.1214	.1197	.1185
29,400	.1232	.1234	.1190	.1177	.1210	.1220	.1177	.1190	.1217	.1225	.1207	.1195
29,600	.1244	.1246	.1197	.1187	.1220	.1231	.1186	.1201	.1225	.1237	.1217	.1205
29,800	.1258	.1260	.1214	.1196	.1230	.1240	.1205	.1210	.1236	.1250	.1230	.1217
30,000	.1271	.1271	.1220	.1209	.1240	.1251	.1220	.1220	.1245	.1265	.1241	.1228
30,200	.1281	.1282	.1231	.1226	.1246	.1260	.1236	.1238	.1260	.1275	.1253	.1240
30,400	.1301	.1292	.1242	.1239	.1255	.1268	.1248	.1252	.1275	.1287	.1266	.1253
30,600	.1309	.1303	.1253	.1250	.1272	.1277	.1258	.1262	.1291	.1300	.1277	.1264
30,800	.1321	.1316	.1265	.1262	.1295	.1290	.1270	.1275	.1304	.1312	.1291	.1278
31,000	.1337	.1330	.1280	.1269	.1310	.1304	.1283	.1290	.1319	.1325	.1305	.1292
31,200	.1345	.1339	.1291	.1279	.1319	.1323	.1295	.1299	.1326	.1334	.1315	.1302
31,400	.1358	.1350	.1306	.1285	.1325	.1335	.1304	.1310	.1335	.1343	.1325	.1312
31,600	.1371	.1367	.1315	.1299	.1338	.1350	.1310	.1320	.1343	.1355	.1337	.1324
31,800	.1380	.1378	.1321	.1310	.1345	.1361	.1325	.1329	.1355	.1367	.1347	.1334
32,000	.1386	.1387	.1339	.1325	.1360	.1370	.1335	.1340	.1375	.1376	.1359	.1346
32,200	.1394	.1396	.1350	.1336	.1370	.1381	.1349	.1341	.1384	.1385	.1369	.1356
32,400	.1412	.1410	.1370	.1350	.1385	.1390	.1365	.1348	.1395	.1397	.1382	.1369
32,600	.1422	.1415	.1379	.1362	.1396	.1399	.1379	.1368	.1404	.1410	.1393	.1379
32,800	.1435	.1422	.1389	.1374	.1410	.1420	.1390	.1385	.1416	.1421	.1406	.1393
33,000	.1453	.1430	.1395	.1381	.1421	.1430	.1405	.1401	.1429	.1430	.1417	.1401
33,200	.1468	.1445	.1404	.1392	.1432	.1440	.1411	.1415	.1441	.1440	.1429	.1416
33,400	.1475	.1459	.1415	.1402	.1444	.1445	.1420	.1420	.1450	.1451	.1438	.1423
33,600	.1483	.1468	.1425	.1413	.1454	.1454	.1430	.1431	.1465	.1465	.1449	.1436
33,800	.1492	.1480	.1437	.1425	.1461	.1465	.1441	.1450	.1480	.1476	.1461	.1448
34,000	.1505	.1492	.1452	.1437	.1475	.1479	.1455	.1460	.1492	.1489	.1474	.1461
34,200	.1516	.1500	.1464	.1451	.1487	.1492	.1465	.1469	.1501	.1499	.1484	.1471
34,400	.1526	.1513	.1471	.1467	.1500	.1504	.1475	.1481	.1511	.1511	.1496	.1483
34,600	.1535	.1529	.1486	.1480	.1510	.1514	.1485	.1489	.1520	.1522	.1507	.1494
34,800	.1546	.1535	.1495	.1492	.1520	.1525	.1501	.1505	.1531	.1531	.1518	.1505
35,000	.1556	.1545	.1505	.1504	.1531	.1537	.1510	.1512	.1540	.1545	.1529	.1515
35,200	.1572	.1553	.1516	.1513	.1541	.1548	.1520	.1525	.1551	.1558	.1540	.1526
35,400	.1586	.1565	.1530	.1520	.1554	.1560	.1531	.1535	.1560	.1566	.1551	.1537
35,600	.1595	.1575	.1544	.1530	.1566	.1570	.1545	.1544	.1575	.1577	.1562	.1548
35,800	.1605	.1589	.1560	.1540	.1574	.1580	.1560	.1554	.1591	.1586	.1574	.1560
36,000	.1612	.1601	.1568	.1549	.1590	.1595	.1575	.1585	.1604	.1597	.1586	.1572
36,200	.1621	.1610	.1576	.1561	.1605	.1611	.1588	.1575	.1611	.1607	.1596	.1582
36,400	.1629	.1617	.1583	.1575	.1617	.1625	.1601	.1586	.1615	.1618	.1607	.1593
36,600	.1640	.1626	.1594	.1588	.1625	.1636	.1606	.1601	.1623	.1630	.1617	.1603
36,800	.1659	.1639	.1607	.1598	.1646	.1644	.1615	.1619	.1630	.1640	.1630	.1616

No. 5873—Continued.

Load per square inch on crusher guage $\frac{1}{10}$ square inch area.	Total compression.											Mean corrected sets.
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	Mean.	
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
37,000	.1076	.1652	.1621	.1610	.1650	.1650	.1627	.1631	.1640	.1651	.1642	.1628
37,200	.1685	.1665	.1637	.1621	.1665	.1645	.1645	.1640	.1652	.1663	.1654	.1640
37,400	.1692	.1675	.1648	.1630	.1670	.1675	.1645	.1650	.1664	.1672	.1662	.1648
37,600	.1698	.1686	.1654	.1639	.1679	.1686	.1656	.1661	.1676	.1685	.1672	.1658
37,800	.1706	.1695	.1667	.1655	.1690	.1695	.1668	.1671	.1689	.1696	.1683	.1669
38,000	.1716	.1708	.1678	.1668	.1706	.1705	.1685	.1685	.1700	.1707	.1696	.1682
38,200	.1725	.1719	.1689	.1679	.1718	.1718	.1694	.1694	.1710	.1720	.1707	.1693
38,400	.1740	.1730	.1698	.1689	.1724	.1729	.1702	.1699	.1722	.1730	.7116	.1702
38,600	.1747	.1739	.1709	.1698	.1732	.1741	.1710	.1707	.1735	.1739	.1726	.1712
38,800	.1755	.1750	.1725	.1709	.1740	.1750	.1724	.1720	.1745	.1750	.1737	.1723
39,000	.1764	.1761	.1737	.1725	.1749	.1760	.1738	.1731	.1755	.1760	.1748	.1734
39,200	.1776	.1770	.1744	.1742	.1761	.1770	.1746	.1744	.1765	.1770	.1759	.1745
39,400	.1786	.1783	.1756	.1755	.1775	.1785	.1756	.1751	.1775	.1781	.1770	.1756
39,600	.1795	.1791	.1768	.1761	.1790	.1792	.1765	.1760	.1784	.1792	.1780	.1766
39,800	.1804	.1803	.1776	.1765	.1800	.1801	.1774	.1775	.1791	.1803	.1789	.1775
40,000	.1813	.1811	.1783	.1774	.1808	.1815	.1790	.1783	.1801	.1816	.1799	.1785
40,200	.1821	.1823	.1792	.1786	.1819	.1824	.1800	.1795	.1814	.1827	.1811	.1797
40,400	.1832	.1835	.1811	.1798	.1827	.1835	.1816	.1805	.1825	.1837	.1822	.1808
40,600	.1849	.1844	.1825	.1814	.1839	.1846	.1830	.1816	.1834	.1847	.1834	.1820
40,800	.1860	.1856	.1830	.1825	.1849	.1857	.1837	.1825	.1845	.1858	.1844	.1830
41,000	.1865	.1866	.1835	.1832	.1861	.1870	.1844	.1835	.1858	.1870	.1854	.1840
41,200	.1881	.1878	.1843	.1837	.1873	.1881	.1848	.1840	.1869	.1881	.1863	.1849
41,400	.1887	.1894	.1856	.1845	.1885	.1889	.1860	.1852	.1876	.1891	.1873	.1859
41,600	.1895	.1899	.1862	.1858	.1895	.1895	.1870	.1861	.1886	.1900	.1882	.1868
41,800	.1906	.1910	.1874	.1863	.1900	.1902	.1881	.1876	.1895	.1910	.1892	.1878
42,000	.1915	.1915	.1883	.1877	.1912	.1915	.1895	.1889	.1905	.1921	.1903	.1889
42,200	.1924	.1925	.1892	.1890	.1922	.1925	.1905	.1895	.1916	.1933	.1913	.1899
42,400	.1935	.1941	.1905	.1899	.1931	.1934	.1919	.1904	.1926	.1943	.1924	.1910
42,600	.1949	.1954	.1916	.1906	.1944	.1945	.1930	.1911	.1938	.1951	.1934	.1920
42,800	.1965	.1964	.1928	.1915	.1949	.1961	.1940	.1925	.1946	.1965	.1946	.1932
43,000	.1975	.1969	.1940	.1929	.1959	.1970	.1950	.1944	.1958	.1975	.1957	.1943
43,200	.1984	.1977	.1950	.1939	.1975	.1980	.1965	.1945	.1968	.1984	.1967	.1953
43,400	.1990	.1985	.1960	.1949	.1989	.1985	.1975	.1953	.1976	.1994	.1976	.1962
43,600	.1996	.1991	.1968	.1960	.1995	.1994	.1984	.1960	.1985	.2010	.1984	.1970
43,800	.2005	.2004	.1975	.1970	.2002	.2001	.1990	.1975	.1994	.2021	.1994	.1980
44,000	.2016	.2014	.1985	.1980	.2015	.2010	.1992	.1990	.2005	.2030	.2004	.1990
44,200	.2027	.2023	.2002	.1990	.2022	.2020	.1993	.1996	.2015	.2036	.2012	.1998
44,400	.2041	.2033	.2005	.2000	.2035	.2032	.1998	.2001	.2025	.2046	.2022	.2008
44,600	.2055	.2045	.2010	.2002	.2045	.2042	.2006	.2005	.2034	.2056	.2030	.2016
44,800	.2050	.2054	.2015	.2010	.2056	.2055	.2019	.2009	.2041	.2067	.2039	.2025
45,000	.2066	.2061	.2024	.2026	.2065	.2065	.2035	.2020	.2051	.2076	.2049	.2035
45,200	.2073	.2075	.2042	.2034	.2074	.2075	.2054	.2028	.2062	.2085	.2060	.2046
45,400	.2083	.2088	.2054	.2040	.2085	.2083	.2060	.2037	.2075	.2094	.2070	.2056
45,600	.2093	.2094	.2068	.2048	.2093	.2089	.2066	.2055	.2085	.2105	.2080	.2066
45,800	.2102	.2102	.2080	.2056	.2103	.2096	.2075	.2062	.2093	.2114	.2088	.2074
46,000	.2113	.2111	.2086	.2066	.2114	.2106	.2085	.2070	.2095	.2121	.2097	.2083
46,200	.2125	.2120	.2092	.2075	.2127	.2119	.2096	.2078	.2103	.2132	.2107	.2093
46,400	.2138	.2126	.2102	.2086	.2139	.2126	.2105	.2086	.2112	.2142	.2116	.2102
46,600	.2145	.2137	.2113	.2096	.2144	.2130	.2112	.2095	.2122	.2149	.2124	.2110
46,800	.2154	.2146	.2120	.2107	.2150	.2142	.2121	.2106	.2130	.2159	.2134	.2120
47,000	.2162	.2155	.2127	.2117	.2162	.2153	.2134	.2119	.2139	.2167	.2144	.2130
47,200	.2172	.2163	.2135	.2129	.2175	.2165	.2144	.2130	.2148	.2175	.2154	.2140
47,400	.2181	.2172	.2144	.2139	.2180	.2172	.2152	.2140	.2159	.2185	.2162	.2148
47,600	.2191	.2182	.2156	.2146	.2190	.2181	.2160	.2150	.2169	.2194	.2172	.2158
47,800	.2197	.2195	.2166	.2154	.2199	.2190	.2169	.2158	.2177	.2204	.2181	.2167
48,000	.2208	.2204	.2175	.2164	.2206	.2201	.2180	.2166	.2185	.2214	.2190	.2176
48,200	.2219	.2213	.2185	.2176	.2217	.2211	.2190	.2174	.2195	.2221	.2200	.2186
48,400	.2226	.2221	.2195	.2188	.2228	.2223	.2202	.2182	.2204	.2230	.2210	.2196
48,600	.2233	.2228	.2203	.2194	.2240	.2232	.2210	.2191	.2210	.2236	.2218	.2204
48,800	.2242	.2236	.2211	.2204	.2251	.2242	.2217	.2202	.2220	.2245	.2227	.2213
49,000	.2250	.2246	.2221	.2216	.2260	.2247	.2223	.2222	.2230	.2256	.2237	.2223
49,200	.2261	.2250	.2230	.2225	.2262	.2251	.2229	.2225	.2239	.2264	.2245	.2231
49,400	.2270	.2267	.2240	.2232	.2266	.2259	.2240	.2231	.2248	.2270	.2252	.2238
49,600	.2277	.2272	.2250	.2238	.2271	.2267	.2250	.2237	.2255	.2280	.2260	.2246
49,800	.2283	.2280	.2260	.2244	.2278	.2275	.2260	.2245	.2264	.2290	.2268	.2254
50,000	.2293	.2292	.2264	.2255	.2287	.2289	.2270	.2255	.2275	.2302	.2278	.2264
50,200	.2302	.2298	.2271	.2266	.2299	.2297	.2277	.2268	.2285	.2305	.2287	.2273
50,400	.2311	.2304	.2275	.2374	.2308	.2304	.2283	.2275	.2290	.2311	.2294	.2280
50,600	.2320	.2311	.2281	.2281	.2319	.2814	.2293	.2280	.2301	.2317	.2302	.2288
50,800	.2327	.2320	.2290	.2285	.2326	.2321	.2305	.2285	.2305	.2327	.2309	.2295
51,000	.2344	.2327	.2296	.2291	.2335	.2330	.2316	.2293	.2315	.2336	.2318	.2304

No. 5873—Continued.

Load per square inch on crusher gauge $\frac{1}{10}$ square inch area.	Total compression.											Mean corrected sets.
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	Mean.	
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
51,200	.2347	.2335	.2308	.2305	.2342	.2337	.2125	.2302	.2324	.2343	.2327	.2313
51,400	.2351	.2343	.2314	.2315	.2354	.2342	.2327	.2313	.2330	.2352	.2334	.2320
51,600	.2360	.2350	.2316	.2321	.2365	.2355	.2334	.2322	.2340	.2360	.2342	.2328
51,800	.2367	.2359	.2322	.2326	.2370	.2360	.2341	.2330	.2347	.2366	.2349	.2335
52,000	.2374	.2364	.2331	.2330	.2380	.2370	.2349	.2339	.2357	.2375	.2357	.2343
52,200	.2382	.2374	.2340	.2340	.2385	.2376	.2359	.2346	.2365	.2381	.2365	.2351
52,400	.2390	.2382	.2349	.2342	.2391	.2385	.2366	.2356	.2371	.2386	.2372	.2358
52,600	.2400	.2388	.2358	.2361	.2396	.2393	.2375	.2365	.2380	.2395	.2381	.2367
52,800	.2408	.2395	.2365	.2371	.2403	.2399	.2383	.2373	.2389	.2404	.2389	.2375
53,000	.2415	.2401	.2371	.2381	.2412	.2411	.2395	.2380	.2395	.2413	.2397	.2383
53,200	.2420	.2410	.2382	.2390	.2422	.2417	.2400	.2385	.2405	.2421	.2405	.2391
53,400	.2426	.2418	.2391	.2396	.2431	.2426	.2405	.2393	.2410	.2429	.2413	.2399
53,600	.2436	.2426	.2398	.2403	.2441	.2429	.2410	.2404	.2420	.2436	.2420	.2406
53,800	.2444	.2435	.2405	.2410	.2452	.2432	.2416	.2411	.2426	.2443	.2427	.2413
54,000	.2451	.2441	.2412	.2413	.2460	.2441	.2425	.2421	.2435	.2452	.2435	.2421
54,200	.2457	.2453	.2416	.2420	.2465	.2449	.2439	.2430	.2440	.2461	.2443	.2429
54,400	.2466	.2458	.2424	.2427	.2470	.2458	.2450	.2435	.2448	.2468	.2450	.2436
54,600	.2475	.2465	.2433	.2436	.2475	.2466	.2457	.2444	.2455	.2475	.2458	.2444
54,800	.2480	.2470	.2443	.2446	.2482	.2474	.2464	.2451	.2461	.2481	.2465	.2451
55,000	.2486	.2477	.2450	.2454	.2488	.2481	.2473	.2455	.2469	.2489	.2472	.2458
55,200	.2492	.2483	.2460	.2460	.2495	.2488	.2477	.2460	.2476	.2495	.2479	.2465
55,400	.2499	.2490	.2465	.2466	.2503	.2496	.2483	.2465	.2484	.2502	.2485	.2471
55,600	.2506	.2499	.2473	.2475	.2514	.2504	.2488	.2471	.2491	.2510	.2493	.2479
55,800	.2514	.2505	.2480	.2482	.2520	.2513	.2497	.2480	.2501	.2515	.2501	.2487
56,000	.2524	.2512	.2486	.2491	.2528	.2523	.2504	.2486	.2506	.2521	.2508	.2495
56,200	.2529	.2522	.2494	.2496	.2534	.2529	.2510	.2494	.2512	.2530	.2514	.2501
56,400	.2535	.2531	.2500	.2501	.2537	.2536	.2516	.2500	.2520	.2535	.2521	.2508
56,600	.2545	.2536	.2506	.2506	.2545	.2546	.2522	.2510	.2528	.2542	.2529	.2516
56,800	.2555	.2544	.2514	.2511	.2554	.2550	.2528	.2516	.2536	.2550	.2536	.2523
57,000	.2560	.2548	.2519	.2520	.2561	.2557	.2535	.2525	.2544	.2558	.2543	.2530
57,200	.2564	.2555	.2524	.2526	.2570	.2562	.2542	.2531	.2551	.2562	.2549	.2536
57,400	.2567	.2561	.2531	.2533	.2576	.2566	.2546	.2536	.2556	.2570	.2554	.2541
57,600	.2572	.2567	.2538	.2540	.2582	.2574	.2552	.2541	.2563	.2577	.2561	.2548
57,800	.2579	.2572	.2545	.2545	.2589	.2578	.2559	.2550	.2570	.2582	.2567	.2554
58,000	.2590	.2579	.2552	.2550	.2594	.2590	.2568	.2557	.2577	.2590	.2575	.2562
58,200	.2595	.2585	.2560	.2566	.2601	.2597	.2576	.2565	.2585	.2600	.2583	.2570
58,400	.2604	.2591	.2566	.2573	.2606	.2605	.2583	.2573	.2590	.2609	.2590	.2577
58,600	.2612	.2594	.2575	.2583	.2615	.2610	.2588	.2581	.2597	.2614	.2597	.2584
58,800	.2619	.2603	.2582	.2589	.2617	.2614	.2595	.2587	.2602	.2615	.2602	.2589
59,000	.2628	.2611	.2587	.2597	.2624	.2618	.2604	.2596	.2609	.2624	.2610	.2597
59,200	.2630	.2619	.2591	.2606	.2629	.2625	.2610	.26.3	.2615	.2630	.2616	.2603
59,400	.2635	.2623	.2598	.2611	.2632	.2628	.2614	.2610	.2622	.2634	.2621	.2608
59,600	.2638	.2627	.2605	.2616	.2638	.2639	.2619	.2615	.2629	.2638	.2626	.2613
59,800	.2645	.2634	.2614	.2621	.2643	.2646	.2625	.2620	.2635	.2645	.2633	.2620
60,000	.2648	.2640	.2620	.2626	.2652	.2650	.2634	.2625	.2642	.2650	.2639	.2626

No. 5899.

Mean compression of ten copper cylinders from lot of 300 pounds of metal procured at Frankford Arsenal September, 1889. For use with crusher gauge $\frac{1}{10}$ square inch area.

Mean dimensions of ten cylinders: Length, ".4995; diameter, ".2511.

Load per square inch on crusher gauge $\frac{1}{10}$ square inch area.	Total compression.											Mean corrected sets.
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	Mean.	
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
3,000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	.....	.....
6,000	.0001	.0001	.0001	.0004	.0005	.0004	.0001	.0002	.0002	.0001	.0002	.0002
9,000	.0001	.0009	.0004	.0007	.0010	.0009	.0004	.0009	.0007	.0005	.0006	.0006
12,000	.0009	.0025	.0015	.0026	.0024	.0022	.0019	.0020	.0027	.0019	.0021	.0020
15,000	.0040	.0055	.0039	.0057	.0051	.0045	.0041	.0040	.0055	.0044	.0048	.0046
16,000	.0046	.0060	.0045	.0061	.0058	.0053	.0049	.0055	.0061	.0051	.0054	.0052
17,000	.0059	.0072	.0055	.0074	.0068	.0063	.0061	.0066	.0071	.0064	.0065	.0063
18,000	.0067	.0082	.0065	.0087	.0080	.0074	.0071	.0079	.0085	.0075	.0076	.0074
19,000	.0076	.0096	.0074	.0098	.0090	.0083	.0084	.0086	.0098	.0086	.0087	.0084
20,000	.0090	.0106	.0088	.0110	.0103	.0094	.0094	.0099	.0108	.0098	.0099	.0096
21,000	.0102	.0119	.0098	.0125	.0115	.0106	.0105	.0110	.0121	.0109	.0111	.0108
22,000	.0113	.0130	.0110	.0137	.0126	.0118	.0116	.0121	.0131	.0122	.0122	.0118
23,000	.0125	.0141	.0125	.0148	.0140	.0129	.0129	.0135	.0145	.0135	.0135	.0131
24,000	.0135	.0154	.0134	.0160	.0153	.0141	.0140	.0146	.0159	.0148	.0147	.0143
25,000	.0147	.0165	.0146	.0175	.0166	.0154	.0154	.0161	.0171	.0162	.0160	.0155
26,000	.0160	.0180	.0159	.0188	.0180	.0168	.0166	.0175	.0185	.0174	.0174	.0169
27,000	.0179	.0194	.0172	.0202	.0195	.0180	.0182	.0189	.0196	.0184	.0187	.0182
28,000	.0186	.0205	.0188	.0218	.0209	.0195	.0194	.0204	.0212	.0201	.0201	.0196
29,000	.0198	.0221	.0205	.0231	.0223	.0206	.0211	.0219	.0226	.0216	.0216	.0211
30,000	.0214	.0231	.0220	.0246	.0238	.0222	.0226	.0231	.0240	.0231	.0230	.0225
31,000	.0225	.0248	.0230	.0260	.0252	.0235	.0238	.0246	.0254	.0244	.0243	.0237
32,000	.0241	.0261	.0245	.0275	.0269	.0251	.0252	.0259	.0275	.0258	.0259	.0253
33,000	.0255	.0279	.0257	.0290	.0285	.0263	.0269	.0275	.0285	.0275	.0273	.0267
34,000	.0269	.0291	.0274	.0305	.0299	.0279	.0284	.0299	.0299	.0290	.0289	.0282
35,000	.0281	.0310	.0291	.0322	.0315	.0294	.0299	.0305	.0315	.0305	.0304	.0297
36,000	.0298	.0326	.0304	.0337	.0331	.0310	.0315	.0321	.0333	.0319	.0319	.0312
37,000	.0314	.0340	.0325	.0356	.0355	.0325	.0329	.0341	.0349	.0337	.0337	.0329
38,000	.0337	.0360	.0340	.0371	.0365	.0344	.0346	.0358	.0365	.0355	.0354	.0346
39,000	.0350	.0374	.0356	.0389	.0381	.0355	.0363	.0373	.0384	.0369	.0369	.0361
40,000	.0366	.0389	.0370	.0405	.0402	.0374	.0380	.0391	.0401	.0383	.0386	.0377
41,000	.0384	.0410	.0389	.0420	.0417	.0391	.0395	.0408	.0418	.0405	.0404	.0395
42,000	.0401	.0425	.0406	.0441	.0435	.0409	.0415	.0429	.0434	.0425	.0422	.0413
43,000	.0415	.0441	.0424	.0456	.0452	.0430	.0430	.0444	.0450	.0446	.0439	.0429
44,000	.0434	.0463	.0440	.0475	.0473	.0446	.0448	.0466	.0470	.0460	.0458	.0448
45,000	.0452	.0480	.0459	.0492	.0488	.0466	.0472	.0482	.0490	.0480	.0476	.0466
46,000	.0469	.0498	.0475	.0510	.0509	.0481	.0492	.0497	.0508	.0497	.0494	.0483
47,000	.0488	.0519	.0495	.0534	.0528	.0506	.0511	.0519	.0530	.0514	.0514	.0503
48,000	.0506	.0534	.0513	.0552	.0547	.0526	.0529	.0539	.0550	.0540	.0534	.0523
49,000	.0527	.0551	.0530	.0574	.0563	.0548	.0546	.0559	.0569	.0555	.0452	.0541
50,000	.0544	.0572	.0552	.0585	.0585	.0567	.0566	.0574	.0590	.0576	.0571	.0560
51,000	.0565	.0594	.0575	.0611	.0605	.0589	.0584	.0595	.0606	.0595	.0592	.0581
52,000	.0584	.0615	.0590	.0635	.0624	.0605	.0606	.0614	.0630	.0610	.0611	.0600
53,000	.0608	.0636	.0616	.0661	.0646	.0624	.0629	.0635	.0652	.0635	.0634	.0623
54,000	.0623	.0661	.0639	.0679	.0667	.0642	.0649	.0664	.0672	.0661	.0656	.0645
55,000	.0640	.0680	.0658	.0701	.0694	.0664	.0670	.0682	.0690	.0688	.0677	.0666
56,000	.0661	.0709	.0683	.0726	.0714	.0684	.0690	.0705	.0714	.0705	.0699	.0688
57,000	.0681	.0724	.0701	.0735	.0733	.0701	.0709	.0724	.0735	.0725	.0717	.0706
58,000	.0706	.0740	.0722	.0764	.0755	.0725	.0734	.0749	.0759	.0741	.0740	.0729
59,000	.0729	.0764	.0741	.0789	.0779	.0742	.0752	.0769	.0786	.0771	.0762	.0751
60,000	.0740	.0789	.0770	.0810	.0795	.0765	.0775	.0798	.0805	.0794	.0784	.0773

No. 5919.

Mean compression of seven copper cylinders from a lot of "Lake" copper procured at Frankford Arsenal from the Scoville Manufacturing Company November, 1892. For use with crusher gauge $\frac{1}{10}$ square inch area.

Mean dimensions of seven cylinders: Length, ".1499; diameter, ".2060.

Load per square inch on crusher gauge $\frac{1}{10}$ square inch area.	Total compression.								Mean corrected sets.
	1.	2.	3.	4.	5.	6.	7.	Mean.	
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
25,000	0.	0.	0.	0.	0.	0.	0.	0.	0.
25,500	.0002	.0003	.0003	.0003	.0004	.0002	.0002	.0003	.0003
26,000	.0004	.0010	.0008	.0008	.0006	.0005	.0004	.0006	.0006
26,500	.0008	.0014	.0010	.0011	.0009	.0008	.0009	.0010	.0010
27,000	.0011	.0015	.0013	.0013	.0011	.0010	.0011	.0012	.0012
27,500	.0014	.0019	.0016	.0016	.0016	.0015	.0017	.0016	.0016
28,000	.0018	.0022	.0021	.0022	.0019	.0019	.0021	.0020	.0020
28,500	.0022	.0025	.0025	.0026	.0024	.0023	.0024	.0024	.0024
29,000	.0025	.0029	.0029	.0030	.0029	.0026	.0027	.0028	.0028
29,500	.0028	.0034	.0033	.0032	.0032	.0030	.0031	.0031	.0031
30,000	.0034	.0040	.0037	.0036	.0035	.0033	.0036	.0036	.0035
30,500	.0038	.0043	.0041	.0041	.0040	.0039	.0040	.0040	.0039
31,000	.0042	.0045	.0044	.0045	.0043	.0043	.0045	.0044	.0043
31,500	.0045	.0049	.0048	.0047	.0047	.0046	.0048	.0047	.0046
32,000	.0048	.0052	.0053	.0055	.0050	.0051	.0052	.0052	.0051
32,500	.0053	.0056	.0056	.0056	.0055	.0054	.0057	.0055	.0054
33,000	.0056	.0059	.0059	.0060	.0058	.0059	.0060	.0059	.0058
33,500	.0062	.0065	.0063	.0064	.0065	.0065	.0065	.0064	.0063
34,000	.0067	.0070	.0068	.0068	.0068	.0068	.0070	.0068	.0067
34,500	.0070	.0072	.0070	.0071	.0071	.0072	.0073	.0071	.0070
35,000	.0074	.0078	.0075	.0076	.0075	.0075	.0077	.0076	.0074
35,500	.0079	.0082	.0082	.0080	.0079	.0079	.0083	.0080	.0078
36,000	.0083	.0084	.0084	.0084	.0083	.0083	.0086	.0084	.0082
36,500	.0086	.0088	.0088	.0089	.0088	.0088	.0091	.0088	.0086
37,000	.0092	.0094	.0093	.0092	.0093	.0093	.0095	.0093	.0091
37,500	.0096	.0098	.0098	.0097	.0096	.0097	.0098	.0097	.0095
38,000	.0099	.0101	.0101	.0102	.0100	.0101	.0102	.0101	.0099
38,500	.0103	.0106	.0107	.0105	.0105	.0104	.0107	.0105	.0103
39,000	.0107	.0111	.0110	.0109	.0109	.0108	.0111	.0109	.0107
39,500	.0110	.0115	.0114	.0114	.0114	.0114	.0117	.0114	.0112
40,000	.0116	.0122	.0119	.0117	.0118	.0119	.0122	.0119	.0116
40,500	.0122	.0124	.0123	.0121	.0123	.0123	.0126	.0123	.0120
41,000	.0126	.0130	.0128	.0127	.0129	.0128	.0132	.0129	.0126
41,500	.0131	.0134	.0131	.0132	.0133	.0134	.0137	.0133	.0130
42,000	.0135	.0138	.0134	.0137	.0136	.0138	.0140	.0137	.0134
42,500	.0143	.0144	.0141	.0141	.0141	.0143	.0147	.0143	.0140
43,000	.0147	.0148	.0147	.0148	.0147	.0148	.0151	.0148	.0145
43,500	.0152	.0155	.0150	.0151	.0151	.0153	.0154	.0152	.0149
44,000	.0158	.0159	.0155	.0156	.0156	.0158	.0159	.0157	.0154
44,500	.0162	.0163	.0161	.0162	.0161	.0163	.0164	.0162	.0159
45,000	.0165	.0166	.0165	.0165	.0166	.0168	.0168	.0166	.0163
45,500	.0171	.0172	.0169	.0171	.0172	.0172	.0173	.0171	.0168
46,000	.0174	.0179	.0174	.0176	.0176	.0176	.0179	.0176	.0173
46,500	.0179	.0184	.0179	.0181	.0180	.0180	.0184	.0181	.0178
47,000	.0185	.0189	.0184	.0187	.0185	.0188	.0189	.0187	.0184
47,500	.0188	.0194	.0189	.0191	.0189	.0192	.0193	.0191	.0188
48,000	.0194	.0199	.0194	.0196	.0193	.0196	.0197	.0196	.0193
48,500	.0199	.0203	.0198	.0201	.0197	.0200	.0204	.0200	.0197
49,000	.0203	.0206	.0202	.0205	.0202	.0204	.0209	.0204	.0201
49,500	.0208	.0210	.0208	.0210	.0206	.0209	.0214	.0209	.0206
50,000	.0213	.0215	.0213	.0216	.0211	.0214	.0219	.0214	.0211

No. 6197.

Mean compression of ten copper cylinders from a lot of 300 pounds procured at Frankford Arsenal from the Scoville Manufacturing Company, September, 1889. For use with crusher gauge $\frac{1}{10}$ square inch area in small-arm experiments.

Mean dimensions of ten cylinders: Length, ".4998; diameter, ".2052.

Load per square inch on crusher gauge, $\frac{1}{10}$ square inch area.	Total compression.											Mean corrected sets.
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	Mean.	
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
3,000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	.....	.....
6,000	.0002	.0001	.0002	.0003	0.	.0001	.0002	.0001	0.	.0002	.0001	.0001
9,000	.0023	.0013	.0028	.0028	.0010	.0015	.0006	.0010	.0002	.0003	.0014	.0013
12,000	.0060	.0056	.0075	.0074	.0060	.0060	.0055	.0060	.0041	.0040	.0059	.0057
15,000	.0110	.0099	.0117	.0117	.0110	.0105	.0095	.0104	.0090	.0090	.0104	.0101
16,000	.0133	.0115	.0135	.0135	.0125	.0115	.0105	.0124	.0108	.0101	.0120	.0116
17,000	.0148	.0130	.0153	.0150	.0134	.0135	.0130	.0132	.0120	.0125	.0136	.0132
18,000	.0168	.0149	.0168	.0169	.0156	.0150	.0141	.0152	.0140	.0135	.0153	.0149
19,000	.0185	.0170	.0187	.0185	.0171	.0169	.0160	.0168	.0160	.0155	.0171	.0166
20,000	.0205	.0195	.0205	.0201	.0195	.0190	.0178	.0184	.0175	.0175	.0190	.0185
21,000	.0229	.0205	.0225	.0228	.0215	.0206	.0201	.0211	.0198	.0205	.0212	.0207
22,000	.0240	.0229	.0245	.0244	.0242	.0225	.0219	.0231	.0215	.0210	.0230	.0225
23,000	.0268	.0249	.0270	.0265	.0255	.0248	.0238	.0255	.0235	.0230	.0251	.0245
24,000	.0284	.0262	.0283	.0289	.0277	.0267	.0260	.0279	.0261	.0250	.0271	.0265
25,000	.0310	.0285	.0312	.0308	.0298	.0293	.0277	.0296	.0273	.0272	.0292	.0285
26,000	.0332	.0305	.0322	.0329	.0320	.0310	.0301	.0315	.0301	.0295	.0313	.0306
27,000	.0354	.0334	.0355	.0358	.0340	.0330	.0325	.0335	.0320	.0325	.0338	.0330
28,000	.0381	.0360	.0380	.0377	.0365	.0356	.0347	.0364	.0339	.0340	.0361	.0353
29,000	.0405	.0383	.0404	.0400	.0390	.0384	.0378	.0385	.0365	.0365	.0387	.0378
30,000	.0426	.0410	.0425	.0430	.0418	.0411	.0405	.0413	.0396	.0392	.0413	.0404
31,000	.0455	.0431	.0439	.0456	.0440	.0436	.0428	.0440	.0420	.0440	.0439	.0429
32,000	.0480	.0455	.0476	.0475	.0466	.0462	.0450	.0470	.0440	.0450	.0462	.0452
33,000	.0506	.0480	.0501	.0506	.0496	.0487	.0475	.0495	.0468	.0470	.0488	.0478
34,000	.0531	.0504	.0528	.0530	.0518	.0515	.0505	.0512	.0506	.0496	.0514	.0503
35,000	.0565	.0530	.0555	.0558	.0545	.0545	.0530	.0540	.0521	.0520	.0541	.0530
36,000	.0590	.0561	.0581	.0590	.0570	.0572	.0560	.0565	.0550	.0553	.0569	.0558
37,000	.0619	.0589	.0608	.0613	.0601	.0598	.0580	.0594	.0578	.0585	.0596	.0585
38,000	.0641	.0618	.0635	.0636	.0630	.0627	.0615	.0624	.0606	.0610	.0624	.0613
39,000	.0675	.0644	.0672	.0665	.0659	.0659	.0640	.0654	.0636	.0639	.0654	.0643
40,000	.0705	.0680	.0699	.0698	.0684	.0689	.0670	.0681	.0665	.0665	.0684	.0673
41,000	.0737	.0704	.0731	.0725	.0715	.0717	.0705	.0711	.0692	.0698	.0713	.0702
42,000	.0766	.0738	.0761	.0762	.0756	.0745	.0730	.0745	.0720	.0735	.0746	.0735
43,000	.0795	.0755	.0783	.0790	.0782	.0779	.0765	.0780	.0750	.0760	.0774	.0763
44,000	.0828	.0792	.0820	.0825	.0805	.0815	.0794	.0804	.0785	.0788	.0806	.0795
45,000	.0862	.0827	.0850	.0852	.0832	.0840	.0820	.0835	.0820	.0820	.0836	.0825
46,000	.0890	.0850	.0877	.0886	.0871	.0870	.0853	.0870	.0845	.0855	.0867	.0856
47,000	.0925	.0876	.0925	.0913	.0902	.0902	.0885	.0890	.0870	.0880	.0897	.0885
48,000	.0956	.0919	.0945	.0942	.0940	.0936	.0920	.0925	.0902	.0920	.0930	.0918
49,000	.0984	.0950	.0970	.0980	.0965	.0970	.0947	.0965	.0939	.0945	.0961	.0949
50,000	.1015	.0974	.1010	.1008	.1010	.0998	.0980	.1001	.0970	.0975	.0994	.0982
51,000	.1050	.1005	.1045	.1040	.1038	.1035	.1015	.1040	.1002	.1005	.1027	.1015
52,000	.1084	.1048	.1080	.1074	.1063	.1065	.1040	.1065	.1030	.1035	.1058	.1046
53,000	.1118	.1065	.1110	.1110	.1090	.1096	.1076	.1090	.1065	.1070	.1089	.1077
54,000	.1144	.1098	.1135	.1138	.1126	.1130	.1110	.1115	.1102	.1105	.1120	.1108
55,000	.1180	.1129	.1162	.1176	.1157	.1164	.1137	.1146	.1140	.1131	.1152	.1140
56,000	.1208	.1170	.1194	.1205	.1190	.1194	.1170	.1180	.1170	.1170	.1185	.1173
57,000	.1240	.1195	.1230	.1230	.1225	.1225	.1201	.1215	.1195	.1196	.1215	.1203
58,000	.1273	.1229	.1265	.1272	.1255	.1256	.1235	.1245	.1228	.1230	.1249	.1237
59,000	.1301	.1260	.1294	.1305	.1285	.1286	.1265	.1266	.1265	.1270	.1280	.1267
60,000	.1339	.1297	.1325	.1338	.1321	.1321	.1309	.1315	.1301	.1305	.1317	.1304
61,000	.1369	.1326	.1357	.1369	.1355	.1360	.1339	.1340	.1329	.1339	.1348	.1335
62,000	.1402	.1364	.1394	.1410	.1383	.1389	.1370	.1365	.1358	.1368	.1380	.1361
63,000	.1439	.1401	.1421	.1430	.1418	.1428	.1405	.1410	.1390	.1394	.1414	.1401
64,000	.1462	.1428	.1451	.1458	.1450	.1451	.1440	.1436	.1415	.1430	.1442	.1429
65,000	.1491	.1450	.1480	.1487	.1475	.1489	.1465	.1465	.1450	.1450	.1470	.1457
66,000	.1527	.1475	.1511	.1520	.1510	.1514	.1493	.1498	.1488	.1481	.1502	.1489
67,000	.1568	.1504	.1530	.1550	.1539	.1546	.1517	.1530	.1530	.1515	.1533	.1520
68,000	.1599	.1535	.1574	.1578	.1570	.1575	.1548	.1557	.1560	.1545	.1564	.1550
69,000	.1625	.1575	.1605	.1615	.1604	.1606	.1570	.1590	.1590	.1572	.1595	.1581
70,000	.1651	.1603	.1630	.1640	.1628	.1632	.1610	.1621	.1620	.1605	.1624	.1610
71,000	.1685	.1627	.1657	.1677	.1660	.1665	.1635	.1650	.1644	.1630	.1653	.1639
72,000	.1720	.1668	.1691	.1708	.1689	.1698	.1670	.1679	.1690	.1670	.1687	.1673

No. 6197—Continued.

Load per square inch on crusher gauge, $\frac{1}{10}$ square inch area.	Total compression.											Mean corrected sets.
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	Mean.	
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
73,000	.1744	.1705	.1722	.1742	.1713	.1729	.1698	.1702	.1702	.1701	.1716	.1702
74,000	.1772	.1735	.1750	.1775	.1748	.1752	.1725	.1739	.1735	.1731	.1746	.1732
75,000	.1801	.1750	.1780	.1804	.1780	.1788	.1755	.1764	.1771	.1762	.1775	.1761
76,000	.1830	.1770	.1805	.1830	.1805	.1820	.1780	.1791	.1802	.1795	.1803	.1789
77,000	.1857	.1801	.1830	.1861	.1840	.1850	.1805	.1825	.1835	.1825	.1833	.1819
78,000	.1884	.1839	.1855	.1895	.1860	.1908	.1838	.1855	.1866	.1855	.1865	.1851
79,000	.1914	.1875	.1881	.1920	.1890	.1929	.1865	.1881	.1898	.1884	.1894	.1880
80,000	.1943	.1894	.1914	.1948	.1915	.1939	.1901	.1909	.1930	.1907	.1920	.1906
81,000	.1970	.1915	.1942	.1980	.1940	.1974	.1934	.1930	.1955	.1935	.1947	.1933
82,000	.1995	.1932	.1965	.2013	.1975	.2001	.1950	.1954	.1985	.1968	.1974	.1960
83,000	.2023	.1960	.1991	.2038	.2001	.2030	.1978	.1977	.2015	.1995	.2001	.1987
84,000	.2041	.1984	.2015	.2068	.2025	.2056	.2002	.2002	.2051	.2026	.2027	.2013
85,000	.2066	.2005	.2040	.2095	.2045	.2090	.2030	.2027	.2080	.2051	.2053	.2039
86,000	.2089	.2029	.2068	.2125	.2070	.2120	.2065	.2050	.2100	.2080	.2080	.2066
87,000	.2115	.2055	.2098	.2154	.2098	.2146	.2085	.2080	.2130	.2109	.2107	.2093
88,000	.2140	.2089	.2130	.2181	.2120	.2170	.2104	.2105	.2155	.2135	.2133	.2119
89,000	.2170	.2120	.2150	.2210	.2145	.2201	.2142	.2135	.2185	.2165	.2162	.2148
90,000	.2205	.2140	.2173	.2239	.2177	.2230	.2162	.2156	.2215	.2190	.2189	.2175
91,000	.2216	.2165	.2198	.2263	.2201	.2254	.2190	.2180	.2235	.2211	.2211	.2197
92,000	.2238	.2185	.2220	.2285	.2222	.2275	.2206	.2206	.2265	.2235	.2234	.2220
93,000	.2259	.2211	.2246	.2309	.2248	.2299	.2231	.2231	.2293	.2265	.2259	.2245
94,000	.2280	.2235	.2264	.2328	.2270	.2324	.2244	.2251	.2316	.2288	.2280	.2266
95,000	.2304	.2262	.2292	.2356	.2295	.2347	.2275	.2275	.2340	.2310	.2306	.2292
96,000	.2325	.2280	.2321	.2381	.2315	.2370	.2301	.2301	.2366	.2337	.2330	.2316
97,000	.2347	.2303	.2341	.2405	.2334	.2395	.2326	.2321	.2390	.2360	.2352	.2338
98,000	.2377	.2326	.2360	.2426	.2360	.2416	.2348	.2346	.2416	.2379	.2375	.2361
99,000	.2399	.2342	.2381	.2446	.2380	.2436	.2366	.2365	.2436	.2405	.2396	.2382
100,000	.2414	.2366	.2403	.2465	.2402	.2456	.2387	.2385	.2455	.2430	.2416	.2402

NOTE.—The ten copper cylinders in the preceding table had fine lines or seams present on the cylindrical surfaces.

No. 6198.

Mean compression of ten copper cylinders from lot of 1,000 received from Sandy Hook, June 15, 1893, for use in crusher gauge $\frac{1}{10}$ square inch area with Brown segmental wire gun.

Copper cylinders received at Sandy Hook, May 22, 1893, from Frankford Arsenal.

Mean dimensions of ten cylinders: Length, ".4996; diameter, ".2509.

Load per square inch on crusher gauge $\frac{1}{10}$ square inch area.	Total compression.											Mean corrected sets.
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	Mean.	
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
38,000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
40,000	.0084	.0086	.0097	.0100	.0075	.0072	.0072	.0086	.0079	.0082	.0083	.0069
40,200	.0096	.0096	.0107	.0107	.0087	.0088	.0083	.0097	.0088	.0093	.0094	.0080
40,400	.0102	.0106	.0115	.0116	.0098	.0098	.0095	.0106	.0096	.0101	.0103	.0089
40,600	.0113	.0118	.0130	.0128	.0109	.0108	.0103	.0115	.0105	.0110	.0114	.0100
40,800	.0120	.0129	.0140	.0140	.0122	.0116	.0112	.0126	.0114	.0120	.0124	.0110
41,000	.0132	.0142	.0151	.0153	.0136	.0123	.0124	.0137	.0125	.0131	.0135	.0121
41,200	.0142	.0152	.0159	.0165	.0147	.0135	.0134	.0150	.0137	.0142	.0146	.0132
41,400	.0155	.0164	.0170	.0174	.0155	.0144	.0145	.0162	.0148	.0151	.0157	.0143
41,600	.0164	.0174	.0182	.0187	.0164	.0156	.0155	.0171	.0162	.0159	.0167	.0153
41,800	.0177	.0184	.0191	.0196	.0172	.0167	.0166	.0182	.0171	.0169	.0177	.0163
42,000	.0189	.0193	.0202	.0206	.0187	.0178	.0179	.0192	.0181	.0183	.0189	.0175
42,200	.0197	.0203	.0208	.0216	.0205	.0188	.0191	.0203	.0191	.0194	.0200	.0186
42,400	.0207	.0215	.0217	.0226	.0208	.0198	.0202	.0213	.0201	.0206	.0209	.0195
42,600	.0218	.0226	.0227	.0236	.0222	.0208	.0211	.0222	.0212	.0215	.0220	.0206
42,800	.0227	.0236	.0240	.0246	.0233	.0218	.0220	.0231	.0223	.0225	.0230	.0216
43,000	.0238	.0247	.0251	.0256	.0241	.0229	.0230	.0243	.0236	.0235	.0241	.0227
43,200	.0249	.0258	.0258	.0266	.0250	.0240	.0240	.0253	.0244	.0245	.0250	.0236
43,400	.0258	.0268	.0267	.0278	.0262	.0252	.0250	.0262	.0253	.0255	.0260	.0246
43,600	.0269	.0278	.0278	.0288	.0272	.0264	.0260	.0270	.0263	.0265	.0271	.0257
43,800	.0280	.0288	.0288	.0298	.0282	.0272	.0270	.0277	.0270	.0274	.0280	.0266
44,000	.0292	.0299	.0299	.0308	.0290	.0283	.0280	.0287	.0277	.0285	.0290	.0275
44,200	.0300	.0308	.0310	.0317	.0300	.0294	.0290	.0297	.0287	.0295	.0300	.0286
44,400	.0310	.0317	.0322	.0325	.0311	.0303	.0300	.0309	.0297	.0305	.0310	.0296
44,600	.0319	.0327	.0330	.0334	.0319	.0316	.0310	.0319	.0307	.0315	.0320	.0306
44,800	.0329	.0336	.0340	.0342	.0327	.0326	.0320	.0329	.0317	.0325	.0329	.0315
45,000	.0339	.0346	.0349	.0350	.0337	.0336	.0330	.0339	.0326	.0335	.0339	.0325
45,200	.0349	.0355	.0365	.0361	.0346	.0346	.0340	.0349	.0336	.0345	.0349	.0335
45,400	.0359	.0366	.0374	.0372	.0355	.0356	.0350	.0359	.0346	.0355	.0359	.0345
45,600	.0369	.0376	.0382	.0382	.0364	.0365	.0359	.0360	.0355	.0364	.0368	.0354
45,800	.0378	.0386	.0391	.0391	.0375	.0375	.0369	.0379	.0365	.0373	.0378	.0364
46,000	.0388	.0397	.0400	.0401	.0384	.0384	.0379	.0389	.0376	.0383	.0388	.0374
46,200	.0398	.0407	.0407	.0410	.0395	.0394	.0389	.0399	.0385	.0392	.0398	.0384
46,400	.0407	.0417	.0415	.0419	.0407	.0404	.0398	.0408	.0394	.0401	.0407	.0393
46,600	.0417	.0426	.0425	.0430	.0416	.0414	.0408	.0416	.0404	.0410	.0417	.0403
46,800	.0426	.0435	.0435	.0438	.0426	.0424	.0417	.0424	.0415	.0418	.0426	.0412
47,000	.0436	.0444	.0445	.0448	.0435	.0434	.0426	.0434	.0425	.0429	.0436	.0422
47,200	.0445	.0453	.0454	.0457	.0443	.0443	.0435	.0444	.0433	.0439	.0445	.0431
47,400	.0454	.0462	.0462	.0469	.0452	.0453	.0445	.0454	.0442	.0448	.0454	.0440
47,600	.0462	.0471	.0470	.0479	.0461	.0462	.0455	.0463	.0449	.0457	.0463	.0449
47,800	.0472	.0480	.0480	.0488	.0469	.0470	.0464	.0471	.0458	.0465	.0472	.0458
48,000	.0481	.0487	.0490	.0497	.0478	.0479	.0474	.0479	.0466	.0473	.0480	.0466
48,200	.0490	.0496	.0500	.0504	.0487	.0487	.0484	.0488	.0477	.0487	.0490	.0476
48,400	.0498	.0507	.0507	.0512	.0495	.0497	.0493	.0497	.0487	.0493	.0499	.0485
48,600	.0507	.0516	.0515	.0519	.0504	.0506	.0501	.0505	.0497	.0503	.0507	.0493
48,800	.0516	.0524	.0525	.0527	.0512	.0515	.0508	.0512	.0505	.0510	.0515	.0501
49,000	.0536	.0534	.0534	.0535	.0521	.0525	.0517	.0520	.0514	.0518	.0524	.0510
49,200	.0535	.0543	.0542	.0544	.0528	.0535	.0526	.0529	.0522	.0527	.0533	.0519
49,400	.0544	.0549	.0551	.0557	.0538	.0545	.0536	.0539	.0529	.0537	.0542	.0528
49,600	.0554	.0558	.0560	.0565	.0547	.0553	.0546	.0549	.0537	.0545	.0551	.0537
49,800	.0563	.0568	.0570	.0574	.0555	.0562	.0556	.0558	.0545	.0554	.0560	.0546
50,000	.0572	.0579	.0579	.0582	.0563	.0571	.0566	.0566	.0553	.0562	.0569	.0555
50,200	.0581	.0581	.0585	.0591	.0572	.0578	.0575	.0574	.0561	.0573	.0577	.0563
50,400	.0588	.0588	.0593	.0598	.0580	.0587	.0585	.0581	.0566	.0582	.0585	.0571
50,600	.0595	.0593	.0599	.0607	.0588	.0593	.0592	.0589	.0575	.0589	.0592	.0579
50,800	.0602	.0602	.0608	.0614	.0597	.0603	.0598	.0597	.0583	.0597	.0600	.0587
51,000	.0611	.0612	.0616	.0622	.0606	.0614	.0605	.0605	.0592	.0605	.0609	.0596
51,200	.0619	.0621	.0624	.0631	.0614	.0622	.0613	.0613	.0601	.0615	.0617	.0604
51,400	.0627	.0628	.0634	.0640	.0622	.0631	.0621	.0621	.0610	.0623	.0626	.0613
51,600	.0638	.0637	.0645	.0648	.0630	.0637	.0629	.0631	.0618	.0630	.0634	.0621

No. 6198—Continued.

Load per square inch on crusher gauge $\frac{1}{10}$ square inch area.	Total compression.											Mean corrected sets.
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	Mean.	
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
51,800	.0646	.0645	.0653	.0656	.0638	.0646	.0637	.0637	.0627	.0638	.0642	.0629
52,000	.0654	.0654	.0662	.0665	.0646	.0655	.0647	.0644	.0635	.0647	.0651	.0638
52,200	.0661	.0659	.0667	.0672	.0657	.0662	.0656	.0654	.0643	.0655	.0659	.0646
52,400	.0671	.0667	.0673	.0679	.0665	.0671	.0663	.0661	.0651	.0660	.0666	.0653
52,600	.0679	.0676	.0680	.0688	.0672	.0679	.0670	.0669	.0658	.0669	.0674	.0661
52,800	.0686	.0682	.0688	.0696	.0678	.0687	.0677	.0676	.0666	.0677	.0681	.0668
53,000	.0695	.0688	.0699	.0703	.0686	.0696	.0687	.0684	.0676	.0680	.0690	.0677
53,200	.0702	.0697	.0708	.0709	.0694	.0703	.0694	.0693	.0684	.0692	.0698	.0685
53,400	.0710	.0703	.0717	.0717	.0700	.0710	.0703	.0702	.0692	.0700	.0705	.0692
53,600	.0718	.0710	.0725	.0726	.0707	.0719	.0713	.0709	.0698	.0706	.0713	.0700
53,800	.0725	.0718	.0732	.0733	.0713	.0726	.0720	.0716	.0704	.0714	.0720	.0707
54,000	.0732	.0729	.0738	.0742	.0720	.0735	.0728	.0723	.0712	.0721	.0728	.0715
54,200	.0740	.0737	.0745	.0751	.0728	.0742	.0734	.0732	.0720	.0728	.0736	.0723
54,400	.0748	.0744	.0751	.0758	.0734	.0748	.0740	.0737	.0727	.0735	.0742	.0729
54,600	.0755	.0752	.0760	.0765	.0742	.0752	.0746	.0745	.0735	.0742	.0749	.0736
54,800	.0762	.0761	.0767	.0772	.0751	.0762	.0752	.0752	.0743	.0748	.0757	.0744
55,000	.0769	.0769	.0774	.0778	.0757	.0771	.0760	.0759	.0753	.0757	.0765	.0752
55,200	.0777	.0775	.0780	.0787	.0764	.0778	.0767	.0767	.0762	.0765	.0772	.0759
55,400	.0784	.0783	.0788	.0794	.0772	.0784	.0776	.0772	.0769	.0772	.0779	.0766
55,600	.0791	.0791	.0794	.0802	.0780	.0791	.0784	.0781	.0775	.0779	.0787	.0774
55,800	.0799	.0797	.0802	.0809	.0788	.0798	.0792	.0787	.0782	.0786	.0794	.0781
56,000	.0806	.0803	.0808	.0816	.0794	.0806	.0800	.0796	.0790	.0792	.0801	.0788
56,200	.0814	.0811	.0816	.0824	.0801	.0811	.0806	.0803	.0796	.0798	.0808	.0795
56,400	.0819	.0817	.0823	.0832	.0810	.0817	.0813	.0810	.0803	.0804	.0815	.0802
56,600	.0826	.0823	.0829	.0838	.0817	.0825	.0820	.0815	.0812	.0812	.0822	.0809
56,800	.0831	.0829	.0835	.0844	.0823	.0832	.0825	.0823	.0817	.0817	.0828	.0815
57,000	.0840	.0835	.0844	.0852	.0831	.0841	.0832	.0831	.0822	.0824	.0835	.0822
57,200	.0847	.0842	.0851	.0857	.0837	.0848	.0838	.0838	.0830	.0832	.0842	.0829
57,400	.0854	.0848	.0857	.0864	.0842	.0854	.0846	.0843	.0835	.0839	.0848	.0835
57,600	.0863	.0854	.0864	.0871	.0849	.0863	.0854	.0851	.0842	.0845	.0856	.0843
57,800	.0870	.0862	.0871	.0877	.0855	.0871	.0860	.0856	.0850	.0852	.0862	.0849
58,000	.0877	.0869	.0878	.0883	.0863	.0878	.0866	.0864	.0855	.0860	.0869	.0856
58,200	.0883	.0874	.0884	.0891	.0869	.0884	.0872	.0871	.0863	.0866	.0876	.0863
58,400	.0891	.0883	.0891	.0897	.0876	.0891	.0879	.0876	.0871	.0874	.0883	.0870
58,600	.0897	.0888	.0898	.0903	.0882	.0896	.0887	.0882	.0877	.0881	.0889	.0876
58,800	.0902	.0894	.0904	.0909	.0890	.0902	.0893	.0888	.0882	.0887	.0895	.0882
59,000	.0909	.0900	.0911	.0916	.0898	.0908	.0899	.0896	.0890	.0892	.0902	.0889
59,200	.0914	.0906	.0917	.0921	.0904	.0915	.0906	.0903	.0897	.0890	.0908	.0895
59,400	.0920	.0912	.0922	.0928	.0909	.0921	.0913	.0911	.0902	.0905	.0914	.0901
59,600	.0926	.0919	.0928	.0935	.0916	.0927	.0920	.0916	.0909	.0912	.0921	.0908
59,800	.0933	.0925	.0934	.0942	.0923	.0933	.0926	.0921	.0914	.0919	.0927	.0914
60,000	.0939	.0932	.0942	.0947	.0931	.0941	.0932	.0928	.0921	.0926	.0934	.0921
61,000	.0977	.0959	.0972	.0976	.0956	.0969	.0962	.0960	.0959	.0956	.0965	.0952
62,000	.1002	.0993	.0999	.1006	.0982	.0999	.0991	.0988	.0979	.0984	.0992	.0979
63,000	.1028	.1022	.1029	.1030	.1013	.1028	.1019	.1016	.1007	.1006	.1020	.1007
64,000	.1057	.1053	.1059	.1061	.1031	.1058	.1042	.1042	.1032	.1030	.1047	.1034
65,000	.1087	.1079	.1085	.1090	.1066	.1081	.1071	.1067	.1062	.1060	.1075	.1062
66,000	.1114	.1106	.1111	.1115	.1096	.1111	.1099	.1091	.1086	.1083	.1101	.1088
67,000	.1140	.1132	.1136	.1140	.1122	.1135	.1127	.1122	.1112	.1109	.1127	.1114
68,000	.1168	.1156	.1168	.1168	.1145	.1159	.1149	.1149	.1135	.1132	.1153	.1141
69,000	.1191	.1182	.1192	.1193	.1174	.1184	.1175	.1171	.1165	.1158	.1179	.1167
70,000	.1218	.1207	.1218	.1220	.1198	.1212	.1199	.1195	.1188	.1184	.1204	.1192
71,000	.1241	.1230	.1240	.1242	.1225	.1232	.1222	.1223	.1210	.1206	.1227	.1215
72,000	.1264	.1255	.1262	.1268	.1245	.1253	.1246	.1251	.1235	.1227	.1251	.1239
73,000	.1287	.1278	.1286	.1291	.1267	.1277	.1270	.1267	.1261	.1250	.1273	.1261
74,000	.1309	.1303	.1311	.1313	.1288	.1297	.1292	.1290	.1282	.1274	.1296	.1284
75,000	.1330	.1323	.1332	.1334	.1314	.1316	.1312	.1310	.1305	.1297	.1317	.1305
76,000	.1353	.1347	.1353	.1355	.1334	.1341	.1331	.1334	.1333	.1317	.1340	.1329
77,000	.1374	.1367	.1376	.1376	.1357	.1360	.1351	.1354	.1348	.1338	.1360	.1349
78,000	.1394	.1387	.1397	.1397	.1376	.1378	.1373	.1374	.1364	.1361	.1380	.1369
79,000	.1418	.1408	.1416	.1417	.1396	.1398	.1391	.1394	.1383	.1379	.1400	.1389
80,000	.1437	.1427	.1437	.1439	.1414	.1418	.1407	.1414	.1401	.1402	.1420	.1409
81,000	.1456	.1448	.1457	.1457	.1433	.1436	.1427	.1435	.1419	.1419	.1439	.1429
82,000	.1477	.1463	.1474	.1475	.1453	.1456	.1447	.1453	.1436	.1434	.1457	.1446
83,000	.1497	.1481	.1492	.1492	.1472	.1474	.1467	.1470	.1458	.1452	.1475	.1464
84,000	.1511	.1500	.1511	.1511	.1490	.1492	.1483	.1487	.1475	.1470	.1493	.1483
85,000	.1530	.1520	.1529	.1531	.1505	.1509	.1501	.1507	.1494	.1486	.1511	.1501
86,000	.1546	.1539	.1546	.1549	.1526	.1525	.1519	.1522	.1512	.1502	.1529	.1519
87,000	.1565	.1554	.1562	.1564	.1542	.1542	.1536	.1538	.1528	.1516	.1545	.1535
88,000	.1582	.1574	.1579	.1580	.1559	.1559	.1551	.1557	.1544	.1533	.1562	.1552
89,000	.1599	.1589	.1595	.1594	.1574	.1573	.1567	.1574	.1561	.1551	.1578	.1568

No. 6198—Continued.

Load per square inch on crusher gauge $\frac{1}{10}$ square inch area.	Total compression.											Mean corrected sets.
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	Mean.	
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
90,000	.1614	.1600	.1610	.1611	.1593	.1588	.1585	.1587	.1576	.1566	.1593	.1583
91,000	.1627	.1618	.1625	.1627	.1609	.1603	.1598	.1604	.1592	.1580	.1608	.1598
92,000	.1644	.1632	.1641	.1639	.1622	.1619	.1612	.1620	.1607	.1596	.1623	.1614
93,000	.1660	.1648	.1659	.1655	.1638	.1633	.1626	.1632	.1623	.1612	.1638	.1629
94,000	.1672	.1661	.1673	.1671	.1653	.1649	.1640	.1646	.1637	.1625	.1653	.1644
95,000	.1688	.1675	.1687	.1686	.1667	.1661	.1652	.1659	.1649	.1639	.1666	.1657
96,000	.1702	.1690	.1702	.1698	.1682	.1674	.1667	.1674	.1661	.1654	.1680	.1671
97,000	.1715	.1702	.1715	.1713	.1694	.1688	.1682	.1690	.1676	.1667	.1694	.1685
98,000	.1728	.1715	.1730	.1726	.1709	.1701	.1694	.1702	.1692	.1680	.1708	.1699
99,000	.1741	.1728	.1742	.1738	.1724	.1712	.1708	.1715	.1704	.1692	.1720	.1711
100,000	.1754	.1742	.1754	.1751	.1737	.1723	.1722	.1727	.1715	.1702	.1733	.1724

Compression of Copper Cylinders to Identify or Define Observed Powder Pressures.

Coppers used with the Brown Segmental Wire Gun in gauges No. 1 and No. 2.

Legend.—One used copper of initial compression of 40,000 pounds per square inch; used in gauge No. 1.

	Inch.
Original length	.3276
Final length	.1620
Compression by powder	.1656

To be compared with the above are the two following coppers of 40,000 pounds per sqare inch initial compression:

Copper No. 1.				Copper No. 2.			
Load on copper.	Load per square inch on crusher gauge.	Length of copper.	Compression.	Load on copper.	Load per square inch on crusher gauge.	Length of copper.	Compression.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Pounds.*	*Pounds.*	*Inch.*	*Inch.*
0	0	.3274	0.	0	0	.3266	0.
9,686	96,860	.1635	.1639	9,668	96,680	.1630	.1636
9,750	97,500	.1590	.1684	9,600	96,000	.1602	.1664
				9,600	96,000	.1598	.1668

Legend.—One used copper of initial compression of 50,000 pounds per square inch; used in gauge No. 2.

	Inch.
Original length	.2782
Final length	.1918
Compression by powder	.0864

To be compared with the above are the two following coppers of 50,000 pounds per square inch initial compression:

Copper No. 1.				Copper No. 2.			
Load on copper.	Load per square inch on crusher gauge.	Length of copper.	Compression.	Load on copper.	Load per square inch on crusher gauge.	Length of copper.	Compression.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Pounds.*	*Pounds.*	*Inch.*	*Inch.*
0	0	.2779	0.	0	0	.2776	0.
7,802	78,020	.1935	.0844	7,838	78,380	.1936	.0840
7,802	78,020	.1912	.0867	7,838	78,380	.1914	.0862

COPPERS USED WITH 12″ B. L. RIFLE No. 1.

FIRST USED COPPER.

Legend.—12″ B. L. Rifle (steel) No. 1, April 24, 1893. Initial compression, 24,000 pounds per square inch. Tables, 1890.

	Inch.
Length before firing	.4091
Length after firing	.1875
Compression by powder	.2216

Pressure, about 73,800 pounds per square inch.
Powder charge, 350 pounds. V P Lot 17. Round, 83. "F. P. P."

Unused copper of initial compression of 24,000 pounds per square inch to be compared with above.

Load on copper.	Load per square inch on crusher gauge.	Length of copper.	Compression.	Remarks.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
0	0	.4099	0.	
8,030	80,300	.1898	.2201	
8,030	80,300	.1842	.2257	2nd application of load.

SECOND USED COPPER.

Legend.—12″ B. L. Rifle (steel) No. 1, April 24, 1893.
Initial compression, 24,000 pounds per square inch. Tables of 1890.

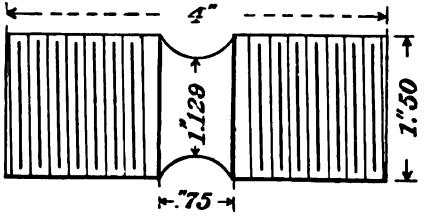
	Inch.
Length before firing	.4095
Length after firing	.1891
Compression by powder	.2204

Pressure about 73,400 pounds per square inch.
Powder charge 350 pounds. V P Lot 17. Round 83. "F. P. P."

Unused copper of initial compression of 24,000 pounds per square inch to be compared with above.

Load on copper.	Load per square inch on crusher gauge.	Length of copper.	Compression.	Remarks.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
0	0	.4093	0.	
7,881	78,810	.1916	.2177	
7,881	78,810	.1868	.2225	2nd application of load.

CAST IRON AND PIG IRON.



CAST IRON.

No. of test.	Description.	Marks.	Chemical composition.								Specific gravity.	Hardness.	Tensile strength per square inch.	Fracture.	Remarks.
			Carbon.			Manganese.	Silicon.	Sulphur.	Phosphorus.	Copper.					
			Total.	Graphitic.	Combined.										
													Pounds.		
5030	Old gun carriage truck wheels.	.....	2.746	2.312	0.434	0.450	1.289	0.082	0.392	0.006	.....	.....	32,220	Granular	
5061	From Watervliet Arsenal.	664, 7 in., No. 2.	.....	.....	.....	.....	.....	.....	.....	.....	7.2634	21.77	25,180	Fine granular	Fractured at root of thread. Stems, ".798 diameter, heads 1" diameter.
6005	.....do.....	651, 12 in.	.....	.....	.....	.....	.....	.....	.....	.....	7.2277	15.75	33,240	Granular, mottled..	
5970	.....do.....	641, No. 3, 12 in.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	35,600	.....do	
5076	Springfield Armory contract iron.	C_1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	20,920	Fine granular	
5077		C_2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	20,280	.....do	
5058	From Robert Poole & Son Co.	69.....	3.406	2.555	0.851	0.450	0.789	0.135	0.417	0.011	.....	16.81	28,270	.....do	
5059	.....do.....	70.....	3.348	2.604	0.744	0.439	0.883	0.140	0.423	0.010	.....	17.17	28,990	.....do	
5062	.....do.....	59 A	.....	.....	.....	.....	.....	.....	.....	.....	.....	14.69	29,520	.....do	
5063	.....do.....	60 B	.....	.....	.....	.....	.....	.....	.....	.....	.....	13.59	24,010	Fine granular, dark gray.	
5065	.....do.....	110 A.....	3.280	2.004	1.276	0.520	1.062	0.180	0.520	0.008	.....	17.35	35,780	Fine granular, light gray.	
5066	.....do.....	114 A	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	36,330	.....do	
5067	.....do.....	118 A	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	35,920	.....do	

5068	.....do.....	125 A	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	35,730	.....do.....	
5069	.....do.....	129 A	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	35,610	.....do.....	
5070	.....do.....	113 B	3.373	2.367	1.016	0.450	1.104	0.192	0.466	0.010	7.2739	19.70	36,820	.....do.....	
5071	.....do.....	117 B	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	36,010	.....do.....	
5072	.....do.....	121 B	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	35,480	.....do.....	
5073	.....do.....	128 B	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	32,400	.....do.....	
5074	.....do.....	132 B	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	34,580	.....do.....	

CAST IRON FROM WATERTOWN ARSENAL FOUNDRY.

5021	12" mortar shell.....	No. 1, $\frac{1}{16}$...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	26,410	Fine granular, mottled.	Cylinder.
5022	.....do.....	No. 1, $\frac{1}{16}$...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	26,780	.....do.....	Do.
5023	.....do.....	No. 1, $\frac{1}{16}$...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	24,520	.....do.....	Body of shell.
5025	.....do.....	No. 1, $\frac{1}{16}$...	3.340	2.053	1.287	0.309	1.222	0.124	0.389	.....	.....	.....	24,990	.....do.....	Base of shell.
5024	.....do.....	No. 2, $\frac{1}{16}$...	3.097	2.252	0.845	0.297	1.194	0.158	0.489	.....	.....	.....	27,080	.....do.....	Cylinder.
5026	.....do.....	No. 3, $\frac{1}{16}$...	3.288	2.184	1.104	0.400	1.052	0.143	0.943	.....	.....	.....	28,980	.....do.....	Do.
5027	.....do.....	No. 4, $\frac{1}{16}$...	3.228	2.342	0.886	0.361	1.052	0.145	.....	.....	.....	.....	29,070	.....do.....	Do.
5029	.....do.....	$\frac{1}{16}$...	3.547	2.345	1.202	0.361	1.034	0.135	0.366	0.010	.....	.....	27,440	.....do.....	Do.
5032	.....do.....	No. 12, $\frac{1}{16}$...	3.223	2.338	0.885	0.374	0.798	0.148	0.375	0.008	.....	.....	30,480	.....do.....	
5033	.....do.....	No. 16, $\frac{1}{16}$...	2.170	1.807	0.360	0.232	0.930	0.126	0.327	0.008	.....	.....	29,970	.....do.....	
5057	12" shot, cast Mar. 3, 1893.	.....	3.281	2.645	0.636	0.342	0.752	0.114	0.471	0.000	7.1998	16.56	29,100	Fine granular.....	
5060	12" shot, cast Apr. 22, 1893.	.....	3.410	2.958	0.452	0.341	1.052	0.095	0.570	0.000	7.2457	15.67	28,050	Fine granular, mottled.	
5064	12" shell, cast May 17, 1893.	.....	3.490	.....	.....	.....	.....	0.132	.....	.....	.....	15.43	28,760	.....do.....	
5055	10" shot, cast Feb. 25, 1893.	.....	3.046	2.413	0.633	0.295	1.015	0.150	0.489	0.006	7.2152	17.44	28,120	Granular, mottled...	
5056	10" shot, cast Mar. 11, 1893.	.....	2.958	2.435	0.523	0.297	0.940	0.140	0.539	0.010	7.2215	17.26	28,670	.....do.....	
5044	8" and 10" shot, cast Dec. 3, 1892.	.....	2.946	2.563	0.383	0.193	1.250	0.170	0.456	0.005	7.2230	17.99	29,970	.....do.....	
5050	8" and 10" shot, cast Feb. 1, 1893.	.....	3.616	2.672	0.944	0.307	1.084	0.135	0.554	.....	7.1968	16.73	28,140	Granular, dark mottled.	
5051	8" and 10" shot, cast Feb. 11, 1893.	.....	3.386	2.563	0.823	0.297	0.827	0.137	0.466	0.000	7.2082	17.62	31,200	Granular, mottled..	
5034	8" solid shot.....	No. 1, $\frac{1}{16}$...	2.184	1.824	0.357	0.213	0.996	0.162	0.803	0.006	.....	.....	25,890	.....do.....	
5039	.....do.....	No. 2.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	23,310	.....do.....	Riser end.
5041	8" solid shot, cast Oct. 18, ——	No. 3.....	2.705	2.184	0.521	0.204	0.940	0.167	0.717	0.010	.....	.....	25,890	.....do.....	Do.
5045	8" solid shot, cast Dec. 13, 1892.	.....	2.849	2.129	0.720	0.185	1.270	0.125	0.464	0.005	7.2327	17.90	26,840	.....do.....	
5046	8" solid shot, cast Dec. 24, 1892.	.....	2.836	2.290	0.546	0.174	1.165	0.153	0.489	0.000	7.2157	18.98	29,280	.....do.....	
5049	8" solid shot, cast Jan. 19, 1893.	.....	2.822	2.358	0.464	0.183	0.639	0.154	0.477	0.009	7.2156	16.81	31,090	.....do.....	
5048	8" cored shot, cast Jan. 11, 1893.	.....	3.114	2.337	0.777	0.197	0.705	0.135	0.497	0.007	7.2243	17.90	32,460	.....do.....	

CAST IRON FROM WATERTOWN ARSENAL FOUNDRY.—Continued.

No. of test.	Description.	Marks.	Chemical composition.								Specific gravity.	Hardness.	Tensile strength per square inch.	Fracture.	Remarks.
			Carbon.			Manganese.	Silicon.	Sulphur.	Phosphorus.	Copper.					
			Total.	Graphitic.	Combined.										
													Pounds		
5042	8" solid shot and 8" shell cast Nov. 3, 1892.	.....	2.754	2.206	0.548	0.184	0.997	0.171	0.727	0.006	7.2296	17.81	30,620	.....do	
5043	8" solid shot and 8" shell, cast Nov. 21, 1892.	.....	2.713	2.181	0.532	0.174	0.958	0.155	0.719	0.010	7.2663	18.68	29,560	.....do	
5040	From cylinder cast with high explosive shell, Oct. 26, 1892.	.....	2.931	2.304	0.627	0.216	0.940	0.165	0.685	0.010	.....	.....	30,040	.....do	
5035	Fractured bedplate for Buffington disappearing carriage.	.....	2.577	1.958	0.619	.....	1.175	.....	.....	.....	.....	.....	23,480	Granular, mottled, light colored.	Inside flange.
5036	.....do.....	.....	.....	1.491	.....	.....	.....	.....	.....	.....	.....	.....	29,500	Fine granular, light colored.	Outside flange.
5037	.....do.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	25,100	Granular, mottled, contains dark spots.	Inside flange annealed.
5038	.....do.....	.....	.....	2.069	.....	.....	.....	.....	.....	.....	.....	.....	30,400	.....do	Outside flange annealed.
5052	Gun carriage metal....	Cupola....	3.125	2.263	0.862	0.268	1.607	0.110	0.886	0.007	7.1500	14.26	21,900	Granular	
5053	.....do.....	Air furnace.	2.958	2.140	0.818	0.313	2.049	0.129	0.781	0.008	7.1973	19.92	28,000	Fine granular.....	
5054	.....do.....	Mold	2.890	2.417	0.483	0.373	1.889	0.129	0.646	0.008	7.1812	19.39	28,400	.....do	
5075	Top-roller path 8" carriage May 19, 1893.	.....	2.836	2.249	0.587	0.342	1.175	0.110	0.603	0.000	7.2425	17.08	28,310	.....do	Air furnace.

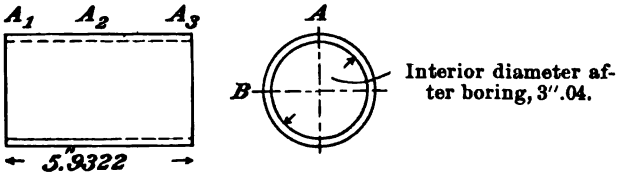
PIG IRON.

5028	Muirkirk pig.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	32,850	Fine granular.....	
5031	.....do.....	No. 2.....	3.150	2.773	0.377	0.748	0.864	0.092	0.342	0.000	.....	.....	31,080	.....do	
5047	.....do.....	.....	3.072	2.098	0.974	0.748	0.752	0.100	0.342	0.000	7.2800	19.29	33,840	.....do	

INTERNAL STRAINS IN SECTION OF HARVEYIZED STEEL BAR E_2.

No. 5992.

A section about 6″ long taken from one end of the bar at the middle of its length after fracture by transverse load.



The cylindrical surface of this bar was intensely hard, the test section being cut out by grinding through the hardened metal with an emery wheel, using an ordinary cutting-off lathe tool through the soft interior metal.

The length and diameters were measured before and after the soft interior metal was entirely bored out, leaving the specimen in its final state, a cylinder with thin walls.

The interior was bored out to 3″.04 diameter, until the hardened metal of the exterior was encountered.

The original exterior diameter was 3″.507. At the places where the diameters were measured in this test the surface was ground, reducing the diameters as given below.

	Inch.
Original length of specimen	5.9322
Final length after boring out center	5.9382
Increase in length	.0060

This result indicates there were longitudinal strains of compression in the bar, the stress corresponding to the above strain of ″.0060 is 30,340 pounds per square inch.

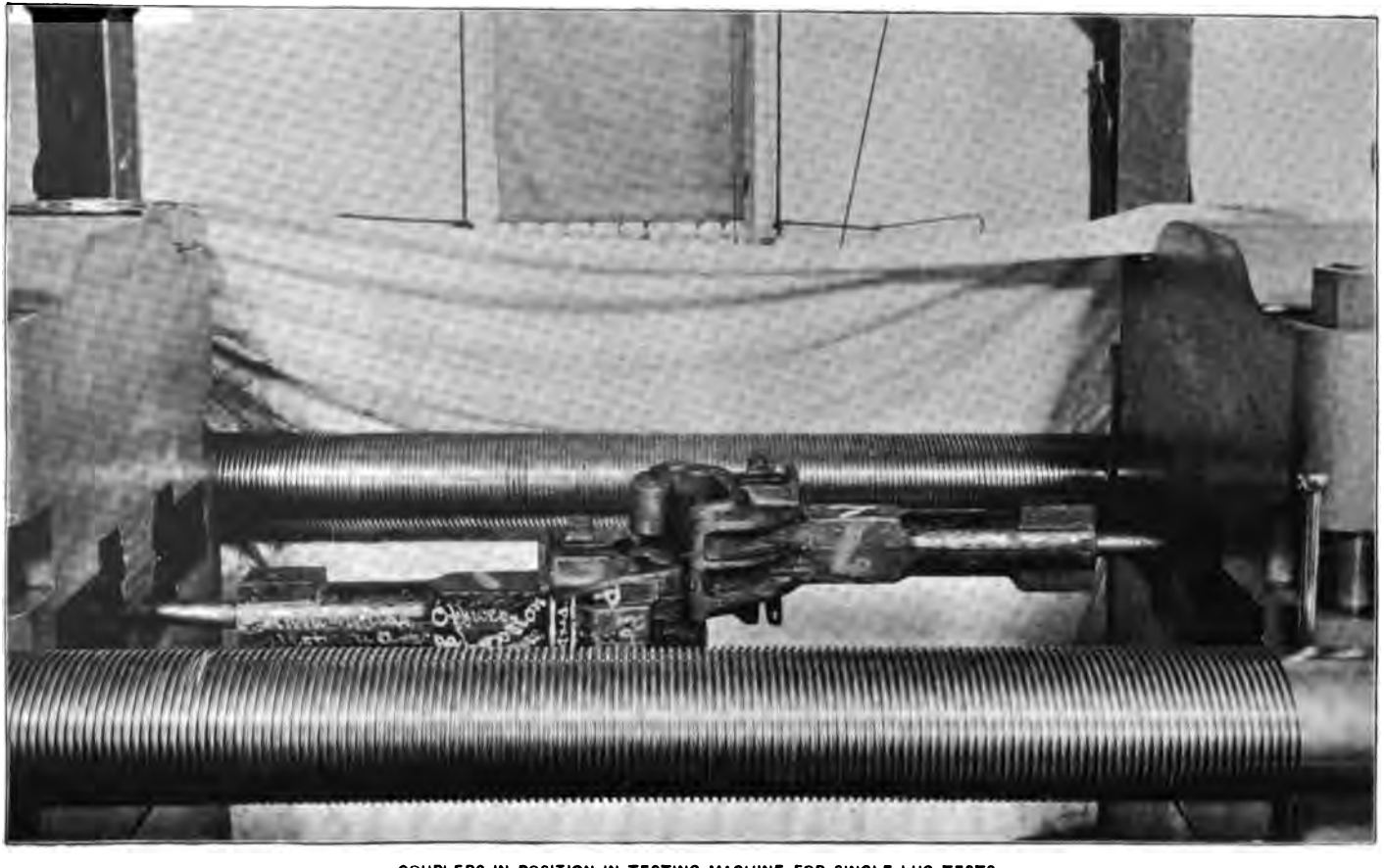
Measurements of diameters.

Diameter.	Before boring out center.	After boring out center.	Difference.
	Inches.	*Inches.*	*Inch.*
A_1	3.5060	3.5113	.0053
A_2	3.4924	3.4965	.0041
A_3	3.4959	3.5024	.0065
B_1	3.5060	3.5131	.0071
B_2	3.4924	3.4978	.0054
B_3	3.4959	3.5031	.0072
Mean	3.4981	3.5040	.0059

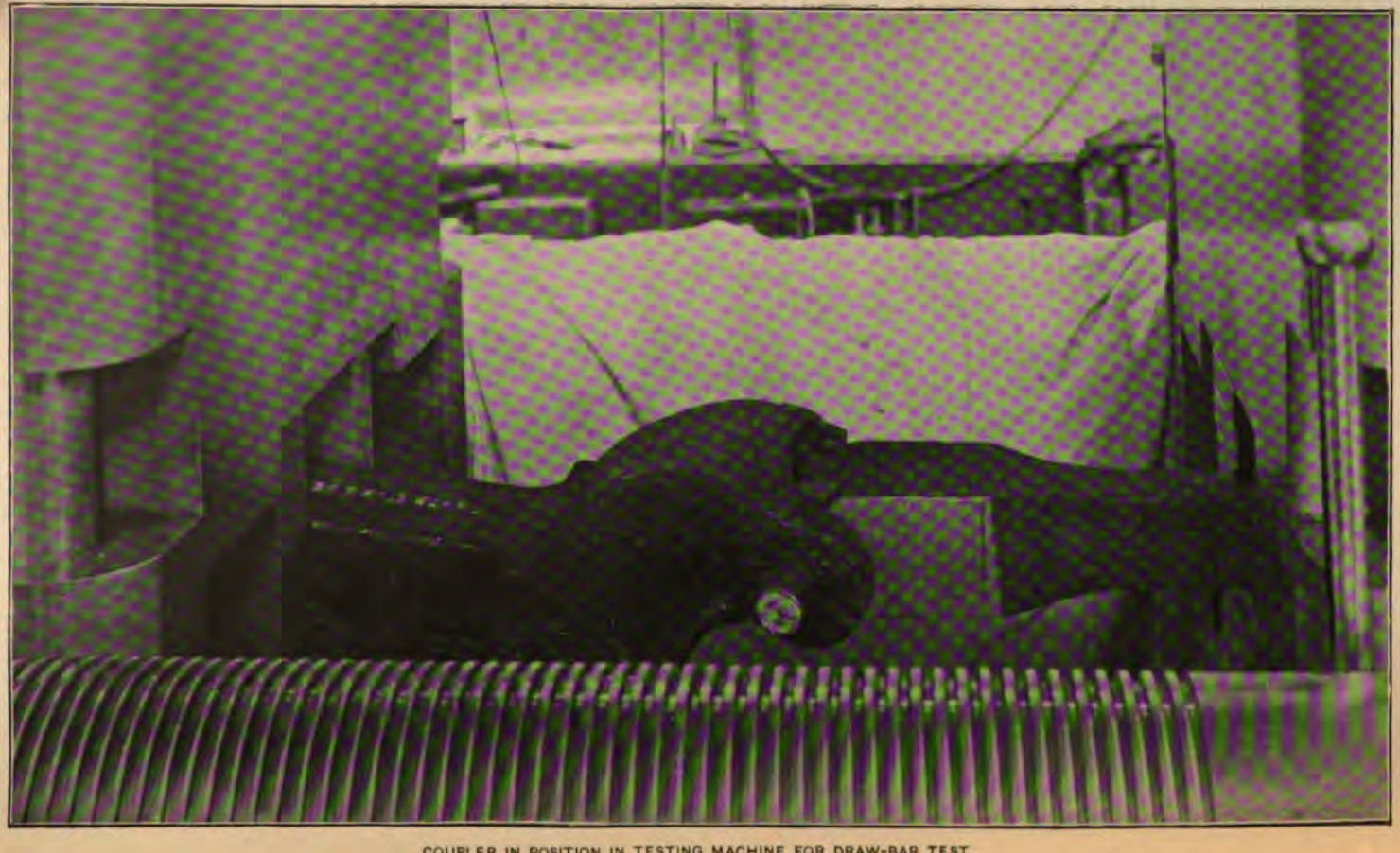
The mean expansion in diameter is ″.0059, indicating tangential strains of compression were in the bar.

The stress corresponding to this strain is 50,600 pounds per square inch.

AUTOMATIC CAR COUPLERS.



COUPLERS IN POSITION IN TESTING MACHINE FOR SINGLE-LUG TESTS.



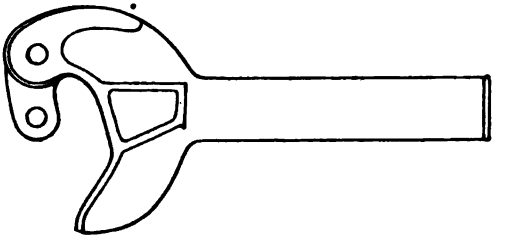
COUPLER IN POSITION IN TESTING MACHINE FOR DRAW-BAR TEST.

AUTOMATIC CAR COUPLERS.

These tests were made for the Master Car Builders' Association.

Eight couplers of a kind were submitted for tensile tests by the different coupler companies or manufacturers.

The type of coupler tested, shown by the following cut,



conformed nearly or quite to the contour lines at present adopted by the master car builders.

The couplers were tested in pairs, coupled together in the manner used in service, and attached to the testing machine by regular tail bolts, or by clamps acting against the yoke blocks of the stems of the couplers.

The details of the tests describe the material of which the draw bar of the coupler and the knuckle is made, the weight of each coupler complete, and the weight of the knuckles.

In stating the number of parts each nut, washer, and pin was counted as a separate part, as well as the larger principal parts.

The knuckle openings were measured in their original position under an initial load of about 1,000 pounds, sufficient to bring the several parts into good bearing condition.

Subsequent measurements were taken under higher loads up to 125,000 pounds, provided fracture did not occur before reaching that limit. Loads were then continued until rupture was reached of some part.

Photographs illustrate the manner of fracture of many of the couplers.

Single lug tests were made with those couplers which were not fractured during the first test.

The couplers were secured in the testing machine, as shown by the photograph which immediately precedes the details of these tests, in such a manner that the upper lug of one coupler came opposite the lower lug of the other.

Finally, drawbar tests were made in which the knuckles were removed and a special bar substituted for the knuckle which was pinned to the drawbar by the regular hinge pin.

AMERICAN COUPLER.

Manufactured by the Solid Steel Company, Alliance, Ohio.

[Material in coupler and knuckle, steel. Number of parts in coupler, 10.]

No. of test.	No. of coupler.	Weight of—		Knuckle opening under loads in pounds of—				Ultimate strength.	Fractured.
		Coupler.	Knuckle.	Original.	75,000.	100,000.	125,000.		
		Pounds	*Pounds*	*Inches*	*Inches*	*Inches*	*Inches*	*Pounds*	
6114	1	215⅜	52	3⅜	3⅜	3 7/16	3⅜	146,300	Sheared hinge pin.
	2	225⅛	52¼	3 3/16	3 5/16	3⅜	3 7/16		
6115	3	227½	52	3 5/16	3⅜	3⅜	3 7/16	157,400	Do.
	4	224¾	51¾	3 3/16	3⅜	3⅜	3 7/16		
6116	5	227	52⅛	3 3/16	3 7/16	3 5/16	3⅜	156,800	Do.
	6	225⅛	51¾	3 3/16	3⅜	3 5/16	3 7/16		
6117	7	227¾	52⅛	3⅜	3 5/16	3 11/16	3 13/16	153,300	Lower lug of drawbar and sheared hinge pin in upper lug.
	8	225⅛	53	3¼	3 7/16	3 5/16	3⅜		

NOTE.—Coupler No. 1 put in machine alone and hinge pin sheared. Ultimate resistance, 147,800 pounds; other parts of coupler remained unfractured.

BROWN EMERGENCY LINK COUPLER.

Manufactured by the Solid Steel Company, Alliance, Ohio.

[Tested without tail bolts. Material in coupler and knuckle, steel. Number of parts in coupler, 12.]

No. of test.	No. of coupler.	Weight of—		Knuckle opening under loads in pounds of—				Ultimate strength.	Fractured.
		Coupler.	Knuckle.	Original.	75,000.	100,000.	125,000.		
		Pounds.	*Pounds.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Pounds.*	
6099	1	231½	37¼	3⅜	3⅜	3⅜	4	147,720	Lock bent and upper lug fractured.
	2	231½	36½	3⅜	3 5/16	3 11/16	3 13/16		
6100	3	230⅛	36¼	3⅜	3 11/16	3 11/16	4 1/16	133,900	Knuckle at hinge-pin hole.
	4	227⅛	36⅛	3 7/16	3 5/16	3 11/16	3 13/16		
6101	5	224½	37⅛	3 7/16	3 5/16	3⅜	3 13/16	149,200	Do.
	6	226½	36½	3 7/16	3⅜	3 11/16	3⅞		
6102	7	231	37	3⅜	3⅜	3 11/16	3⅞	145,300	Sheared off end of locking link.
	8	232⅛	36½	3½	3 13/16	3⅞	4		

BUCKEYE COUPLER.

Manufactured by the Buckeye Malleable Iron Company, Columbus, Ohio.

[Hinge pins, 1½" diameter. Material in coupler, Malleable iron; in knuckle, steel. Number of parts in coupler, 8.]

No. of test.	No. of coupler.	Weight of—		Knuckle opening under loads in pounds of—				Ultimate strength.	Fractured.
		Coupler.	Knuckle.	Original.	75,000.	100,000.	125,000.		
		Pounds.	*Pounds.*	*Inches*	*Inches.*	*Inches.*	*Inches.*	*Pounds.*	
6094	1	222½	58	3⅜	3 5/16	3 11/16	3 13/16	163,180	Tail bolt in No. 1 broke at 127,800 pounds. Knuckle of No. 2; fragment, 6" long. Fine granular.
	2	227½	57¾	3 5/16	3¼	3 9/16	3½		
6095	3	222½	58½	3 7/16	3⅜	3⅜	3 13/16	139,000	Tongue of knuckle, 2" from hinge pin.
	4	226½	59	3 5/16	3 5/16	3 9/16	3½		
6096	5	228½	58½	3⅜	3 5/16	3⅝	3½	147,000	Knuckle at hinge-pin hole. Middle part, 3½" wide of fractured surface acicular and contained dark spongy places. Sides fine granular, radiating from the acicular section.
	6	222½	57¾	3½	3 7/16	3 5/16	3½		
6097	7	224½	58	3 15/16	3 5/16	3 11/16	3 13/16	170,600	Lock slipped, coupler readjusted, and on second loading horn of knuckle fractured under 169,100 pounds. Hinge pin bent 1/16".
	8	221½	57¾	3⅜	3½	3 11/16	3 13/16		

After 127,800 pounds load had been applied to couplers Nos. 1 and 2, and released, knuckle openings were 3 11/16" and 3½", respectively.

CALIFORNIA COUPLER.

Manufactured by the Solid Steel Company, Alliance, Ohio.

[Material in coupler and knuckle, steel. Number of parts in coupler, 7.]

No. of test.	No. of coupler.	Weight of—		Knuckle opening under loads in pounds of—				Ultimate strength.	Fractured.
		Coupler.	Knuckle.	Original.	75,000.	100,000.	150,000.		
		Pounds.	*Pounds.*	*Inches*	*Inches.*	*Inches.*	*Inches.*	*Pounds.*	
6134	1	222	34¾	3½	3 5/16	3 11/16	5	126,800	Uncoupled. Tongue of knuckle bent.
	2	224½	35¾	3 5/16	3⅜	3½	4 13/16		
6135	3	223½	35½	3⅜	3⅜	4	.....	117,100	Tongue of knuckle; fragment 3" long.
	4	221½	35	3 5/16	3 5/16	4½	.....		
6136	5	215½	35¾	3 7/16	3⅜	4½	.....	119,900	Tongues of knuckles bent and heads uncoupled.
	6	226½	35¾	3⅜	3½	4½	.....		
6137	7	220	35½	3½	3⅜	3 13/16	4⅜	130,100	Tongue of knuckle; fragment, 3" long.
	8	235½	35½	3½	3½	3 13/16	4⅜		

CHICAGO COUPLER.

Manufactured by Chicago Tire and Spring Company, Chicago, Ill.

[Hinge pins, 1¼" diameter. Material in coupler and knuckle, steel. Number of parts in coupler, 7.]

No. of test.	No. of coupler.	Weight of—		Knuckle opening under loads in pounds of—				Ultimate strength.	Fractured.
		Coupler.	Knuckle.	Original.	75,000.	100,000.	125,000.		
		Pounds.	*Pounds.*	*Inches*	*Inches.*	*Inches.*	*Inches.*	*Pounds.*	
6079	1	222	53⅜	3 1/16	3⅛	3 3/16	3⅜	195,200	Locking device sheared.
	2	216	54¼	3¼	3⅜	3 7/16	3½		
6080	3	220	53⅛	3⅛	3 5/16	3 7/16	3⅝	169,700	Knuckle through hinge-pin hole. Fine granular.
	4	217⅛	53⅛	3⅛	3 5/16	3⅜	3 11/16		
6081	5	219⅜	53½	3 1/16	3⅜	3⅜	3 5/16	185,600	Pin broke. Load sustained after pin broke 175,000 pounds, then lugs of draw bar began to fracture.
	6	222¾	53¾	3⅜	3⅜	3 5/16	3 5/16		
6082	7	218	53⅛	3 1/16	3 7/16	3⅛	3 5/16	171,100	Locking device.
	8	217⅛	51¼	3¼	3 7/16	3 5/16	3 5/16		

DREXEL COUPLER.

Manufactured by the Solid Steel Company, Alliance, Ohio.

[Tested without tail bolts. Material in coupler and knuckle, steel. Number of parts in coupler, 7.]

No. of test.	No. of coupler.	Weight of—		Knuckle opening under loads in pounds of—				Ultimate strength.	Fractured.
		Coupler.	Knuckle.	Original.	75,000.	100,000.	125,000.		
		Pounds.	*Pounds.*	*Inches*	*Inches.*	*Inches.*	*Inches.*	*Pounds.*	
6104	1	199	58½	3¼	3⅜	3⅛	3 1/16	161,600	End of tongue of knuckle.
	2	201	56¼	3 1/16	3 1/16	3 7/16	3 1/16		
6105	3	207⅜	58¼	3¼	3⅜	3 1/16	3 1/16	147,900	Do.
	4	198½	57¾	3 1/16	3⅜	3⅜	4		
6106	5	201⅛	58⅛	3 1/16	3⅜	3⅜	3 1/16	146,000	Do.
	6	202	59½	3¼	3 7/16	3⅜	3⅜		
6107	7	200⅛	57½	3¼	3 7/16	3 7/16	3 1/16	153,700	Do.
	8	200⅜	57⅛	3⅜	3 5/16	3¼	3 1/16		

GOULD COUPLER.

Manufactured by the Erie Malleable Iron Company, Erie, N. Y.

[Hinge pins, 1⅝" diameter. Material in coupler, malleable iron; in knuckle, steel. Number of parts in coupler, 9.]

No. of test.	No. of coupler.	Weight of—		Knuckle opening under loads in pounds of—				Ultimate strength.	Fractured.
		Coupler.	Knuckle.	Original.	75,000.	100,000.	125,000.		
		Pounds.	*Pounds.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Pounds.*	
6068	1	203	36½	3⅜	3½	3 9/16	3⅝	129,100	Lugs of draw bar, 4" from center of hinge-pin hole.
	2	201	37½	3⅜	3 9/16	3⅜	3⅝		
6069	3	204	37	3 1/16	3 1/16	3 1/16	3⅝	129,900	Do.
	4	204	36⅜	3½	3⅝	3 9/16	3 11/16		
6070	5	204	37⅛	3⅜	3⅝	3⅜	3⅝	137,580	Do.
	6	204	37	3⅜	3 11/16	3 11/16	3⅝		

HINSON COUPLER.

Manufactured by the National Malleable Casting Company, Chicago, Ill.

[Hinge pins 1⅝" diameter. Material in coupler, malleable iron; in knuckle, steel. Number of parts in coupler, 8.]

No. of test.	No. of coupler.	Weight of—		Knuckle opening under loads in pounds of—				Ultimate strength.	Fractured.
		Coupler.	Knuckle.	Original.	75,000.	100,000.	125,000.		
		Pounds.	*Pounds.*	*Inches*	*Inches.*	*Inches.*	*Inches.*	*Pounds.*	
6139	1	222½	55½	3⅜	3½	3 9/16	.....	125,000	Sustained maximum load one-half minute, then both lugs of draw-bar No. 2 fractured at hinge pin, also one lug of bar. No. 1 fractured at same place.
	2	224⅛	56⅛	3 5/16	3 7/16	3½	.....		
6140	3	228½	56½	3 5/16	3 7/16	3½	3⅝	138,200	Both lugs.
	4	223½	54⅝	3 5/16	3 7/16	3½	3⅝		
6141	5	213½	49⅝	3⅜	3⅝	3 7/16	.....	112,400	Stem at shoulder of yoke block.
	6	211⅛	50½	3½	3⅝	3 7/16	.....		
6142	7	216	52⅛	3½	3⅝	3⅝	.....	124,400	Stem 2" to 5" from shoulder of yoke block.
	8	209⅛	50	3⅜	3 7/16	3 9/16	.....		

JANNEY COUPLER.

Manufactured by the McConway & Torley Company, Pittsburg, Pa.

[Material in coupler, malleable iron; in knuckle, wrought iron. Number of parts in coupler, 10.]

No. of test.	No. of coupler.	Weight of—		Knuckle opening under loads in pounds of—				Ultimate strength.	Fractured.
		Coupler.	Knuckle.	Original.	75,000.	100,000.	125,000.		
		Pounds.	*Pounds.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Pounds.*	
6109	1	215	37⅛	3⅜	3⅜	.....	.....	91,300	Fracture started in tongue of knuckle No. 1. End of tongue of knuckle No. 2. Dull fibrous spot ".9 by ".4, granular near center.
	2	216½	38⅛	3⅜	3 1/16	.....	.....		
6110	3	217½	37⅛	3⅛	3⅜	.....	.....	84,150	End of tongue of knuckle. Dull fibrous, 50 per cent; granular, 50 per cent
	4	215½	37⅛	3⅜	3⅜	.....	.....		
6111	5	213	37½	3⅜	3 3/16	.....	.....	93,400	End of tongue of knuckle. Dull fibrous, 45 per cent; granular, 55 per cent.
	6	216½	37⅛	3 5/16	3⅜	.....	.....		
6112	7	218½	36⅜	3 5/16	3 3/16	.....	.....	92,800	Lock.
	8	211⅜	37⅛	3 7/16	3 3/16	.....	.....		

JOHNSON COUPLER.

[Material in coupler and knuckle, malleable iron. Number of parts in coupler, 11.]

No. of test.	No. of coupler.	Weight of—		Knuckle opening under loads in pounds of—				Ultimate strength.	Fractured.
		Coupler.	Knuckle.	Original.	75,000.	100,000.	125,000.		
		Pounds.	*Pounds.*	*Inches*	*Inches.*	*Inches.*	*Inches.*	*Pounds.*	
6144	1	177	35⅛	3⅛	.....	.....	.....	49,800	Tongue of knuckle at angle.
	2	175	36	3⅛	.....	.....	.....		
6145	3	176⅛	35⅛	3⅜	3⅜	.....	.....	83,100	Lugs of draw bar 3" from center of hinge-pin holes.
	4	179⅜	35⅜	3⅜	3 1/16	.....	.....		
6146	5	177	36⅛	3⅛	3⅜	.....	.....	79,300	Do.
	6	175½	36½	3 5/16	3 7/16	.....	.....		
6147	7	176⅛	35½	3⅜	.....	.....	.....	75,000	Do.
	8	176	35⅛	3 1/16	.....	.....	.....		

LUDLOW COUPLER.

Manufactured by the Springfield Malleable Iron Company, Springfield, Ohio.

[Malleable iron hollow hinge pins, 2½" exterior diameter, 1⅝" diameter of hole. Material in coupler and knuckle, mixture of malleable iron and steel. Number of parts in coupler, 12, 3 pieces included in clevis.]

No. of test.	No. of coupler.	Weight of—		Knuckle opening under loads in pounds of—				Ultimate strength.	Fractured.
		Coupler.	Knuckle.	Original.	75,000.	100,000.	125,000.		
		Pounds.	*Pounds.*	*Inches*	*Inches.*	*Inches.*	*Inches.*	*Pounds.*	
6089	1	225	68½	3 7/16	.....	.....	.....	67,000	Knuckle at hinge-pin hole, also hinge pin of No. 2 fractured. Spongy on tension side.
	2	223½	69¼	3 7/16	.....	.....	.....		
6090	3	223½	69	3½	.....	.....	.....	68,100	Knuckle and hinge pin fractured. Spongy metal on tension side of knuckle fracture.
	4	223	69¼	3½	.....	.....	.....		
6091	5	224¼	69½	3½	3 9/16	.....	.....	80,800	Knuckle at hinge pin and hinge pin of No. 5 fractured.
	6	215	69	3 7/16	3 11/16	.....	.....		
6092	7	223	68¼	3 7/16	.....	.....	.....	61,000	Knuckle.
	8	221½	68	3 7/16	.....	.....	.....		

NATIONAL COUPLER, FORMERLY CALLED PERFECTED.

Manufactured by the Solid Steel Company, Alliance, Ohio.

[Material in coupler and knuckle, steel. Number of parts in coupler, 11.]

No. of test.	No. of coupler.	Weight of—		Knuckle opening under loads in pounds of—				Ultimate strength.	Fractured.
		Coupler.	Knuckle.	Original.	75,000.	100,000.	125,000.		
		Pounds.	*Pounds.*	*Inches*	*Inches.*	*Inches.*	*Inches.*	*Pounds.*	
6084	1	217	49½	3½	3 9/16	3 11/16	3 13/16	135,400	Knuckle at hinge-pin hole.
	2	216½	50½	3 15/16	3 7/16	3½	3½		
6085	3	208	50½	3½	3½	3 9/16	3 11/16	155,400	Locking pin.
	4	218½	51	3 7/16	3½	3½	3½		
*a*6086	5	213	48½	3½	3½	3 9/16	3 11/16	128,300	Knuckle at hinge-pin hole.
	6	206½	49½	3½	3½	3½	3½		
*a*6087	7	215	50½	3 9/16	3 11/16	3 7/16	3 9/16	168,600	Knuckle at hinge-pin hole. Fine granular.
	8	215	49	3½	3 7/16	3½	3½		

a Tested without tail bolts.

RIVERS COUPLER.

[Material in coupler and knuckle, steel. Number of parts in coupler, 4.]

No. of tests.	No. of coupler.	Weight of—		Knuckle opening under loads in pounds of—				Ultimate strength.	Fractured.
		Coupler.	Knuckle.	Original.	75,000.	100,000.	125,000.		
		Pounds.	*Pounds.*	*Inches*	*Inches.*	*Inches.*	*Inches.*	*Pounds.*	
6149	1	262	81½	4½	.....	.....	.....	61,300	Stem, 4½" back of head, 40 per cent granular; 60 per cent dull colored, showing cracks existing in the metal before testing.
	2	251½	82	4⅝	.....	.....	.....		
6150	4	252½	82	4½	5	5⅛	5 1/16	143,400	Shank at end, also sheared hinge pin in lower lug, and started fracture in lock.
	3	254½	82½	4⅝	5	5½	5⅝		
6151	5	255	82½	4 5/16	5⅛	5⅛	5⅜	129,000	Sheared end of knuckle. Pulled off end of shank.
	6	253½	82	4⅜	5 3/16	5 7/16	5⅝		
6152	7	254½	81½	4⅝	5 5/16	5⅛	5⅜	141,200	Sheared hinge pin and fractured lock.
	8	254½	82¼	4 7/16	5⅛	5 7/16	5⅝		

STANDARD COUPLER, FROM THE STANDARD CAR COUPLING COMPANY, TROY, N. Y.

Manufactured by the Bridgeport Malleable Iron Company, Bridgeport, Conn.

Does not have any hinge pin. Material in coupler, malleable iron; in knuckle, pressed steel. Number of parts in coupler, 4.]

No. of test.	No. of coupler.	Weight of—		Knuckle opening under loads in pounds of—				Ultimate strength.	Fractured.
		Coupler.	Knuckle.	Original.	75,000.	100,000.	125,000.		
		Pounds.	*Pounds.*	*Inches*	*Inches.*	*Inches.*	*Inches.*	*Pounds.*	
6119	1	221½	66	3½	3 1/16	3 1/16	3 1/16	149,400	Head at junction with shank.
	2	223½	66½	3½	3⅛	3⅛	3 3/16		
6120	3	230½	66½	3 5/16	3 1/16	3 1/16	3 1/16	164,800	Knuckle at root of angle. Coarse granular.
	4	222	67½	3⅜	3⅜	3⅜	3⅜		
6121	5	220½	65½	3 5/16	3 1/16	3 1/16	3 1/16	153,100	Do.
	6	221	66½	3 5/16	3 5/16	3⅜	3⅜		
6122	7	224	67½	3 5/16	3 5/16	3 1/16	3 1/16	164,500	Do.
	8	222½	66	3 5/16	3 1/16	3⅜	4		

St. Louis Coupler.

Manufactured by the Shickle, Harrison & Howard Iron Company, St. Louis, Mo.

[Hinge pins, 1¼" diameter. Material in coupler and knuckle, steel. Number of parts in coupler, 6.]

No. of test.	No. of coupler.	Weight of—		Knuckle opening under loads in pounds of—				Ultimate strength.	Fractured.
		Coupler.	Knuckle.	Original.	75,000.	100,000.	125,000.		
		Pounds.	*Pounds.*	*Inches*	*Inches.*	*Inches.*	*Inches.*	*Pounds.*	
6071	1	208½	61	3⅛	3 1/16	3 7/16	3⅜	134,000	Shank, 13½" from end.
	2	211½	61½	3⅛	3⅛	3⅜	3 5/16		
6072	3	211½	61½	3⅛	3⅜	3⅜	.....	123,700	Knuckle, at hinge-pin hole.
	4	211½	61½	3⅛	3 1/16	3 7/16	.....		
6073	5	207½	61	3 5/16	3 1/16	3⅜	3⅛	146,900	Do.
	6	212	61	3⅛	3⅜	3⅜	3 5/16		
6074	7	216½	62	3 3/16	3⅛	3⅜	.....	124,000	Knuckle, near hinge-pin hole.
	8	216	61	3⅜	3½	3⅜	.....		

Thurmond Coupler.

Manufactured by Isaac G. Johnson & Co., Spuyten Duyvel, N. Y.

[Hinge pins, 1¼" diameter. Material in coupler, malleable iron; in knuckle, steel. Number of parts in coupler, 8.]

No. of test.	No. of coupler.	Weight of—		Knuckle opening under loads in pounds of—				Ultimate strength.	Fractured.
		Coupler.	Knuckle.	Original.	75,000.	100,000.	125,000.		
		Pounds.	*Pounds.*	*Inches*	*Inches.*	*Inches.*	*Inches.*	*Pounds.*	
6064	1	204	50½	3½	3½	3⅛	3⅜	145,000	Knuckle, at hinge-pin hole.
	2	205½	51	3½	3⅜	3⅜	3⅜		
6065	3	203½	50½	3½	3⅜	3⅜	3⅜	131,900	Shank, 9" from end.
	4	207½	50¾	3½	3½	3 5/16	3½		
6066	5	205	50½	3½	3⅜	3⅛	.....	106,100	Shank, 8¾" from end.
	6	204½	51	3½	3⅛	3⅜	.....		
6067	7	205½	51	3⅜	3⅛	3 5/16	3⅜	137,500	Head, across locking-pin hole.
	8	205½	51	3½	3⅜	3 7/16	3⅛		

TROJAN COUPLER.

[Hinge pins, 1⅛" diameter. Material in coupler, malleable iron; in knuckle, steel. Number of part in coupler, 7.]

No. of test.	No. of coupler.	Weight of—		Knuckle opening under loads in pounds of—				Ultimate strength.	Fractured.
		Coupler.	Knuckle.	Original.	75,000.	10,0000.	125,000.		
		Pounds.	*Pounds.*	*Inches*	*Inches.*	*Inches*	*Inches.*	*Pounds.*	
6124	1	215½	52½	3 1/16	3⅜	3¾	.....	125,000	Lower lug of draw bar head.
	2	217⅛	52	3⅜	3 1/16	3¾	.....		
6125	3	215	52⅛	3⅜	3 1/16	3 1/16	4	136,000	Do.
	4	216	51¾	3 7/16	3⅜	3¾	4 1/16		
6126	5	220	53	3 1/16	3 1/16	3¾	3 1/16	134,300	Do.
	6	217½	52⅛	3⅜	3⅜	3 3/16	4		
6127	7	215⅜	52⅛	3⅜	3⅜	3¾	4	136,100	Do.
	8	214¾	51¾	3⅜	3 1/16	3 1/16	4 1/16		

UNITED STATES COUPLER.

Manufactured by Solid Steel Company, Alliance, Ohio.

[Material in coupler and knuckle, steel. Number of parts in coupler, 5.]

No. of test.	No. of coupler.	Weight of—		Knuckle opening under loads in pounds of—				Ultimate strength.	Fractured.
		Coupler.	Knuckle.	Original.	75,000,	100,000.	125,000.		
		Pounds.	*Pounds.*	*Inches*	*Inches.*	*Inches.*	*Inches.*	*Pounds.*	
6129	1	242¼	71	3 7/16	3⅜	3⅞	.....	108,000	Lock.
	2	244	70⅛	3 7/16	3 5/16	3¾	.....		
6130	3	243¼	69¾	3 7/16	3 5/16	3 1/16	3 1/16	133,800	Do.
	4	239⅛	70⅛	3 7/16	3 5/16	3 1/16	3 1/16		
6131	5	245⅛	70⅜	3 1/16	3 7/16	2 1/16	.....	116,000	At 86,900 pounds corner of lock sheared off and coupler No. 5 unlocked. Locks wedged down and test resumed, and lock of No. 6 fractured.
	6	242	70	3⅜	3⅜	3¾	.....		
6132	7	247⅛	71	3 5/16	3⅜	3 7/16	3⅜	148,800	Lock. Both locks were wedged before testing.
	8	242⅜	71⅛	3 3/16	3 1/16	3⅜	3⅜		

CAR COUPLERS—SINGLE LUG TESTS.

AMERICAN COUPLER.

No. of test.	No. of coupler.	Ultimate strength.	Fractured.
		Pounds.	
6118	4 / 8	135,000	Hinge pins bent and knuckles slipped past each other. No fractures.

BROWN EMERGENCY LINK COUPLER.

6103	3 / 5	99,500	Lower lug.

BUCKEYE COUPLER.

6098	1 / 3	133,400	Lower lug midway hinge-pin hole and coupling-link hole.

CALIFORNIA COUPLER.

6138	4 / 6	70,000	Uncoupled.

CHICAGO COUPLER.

6083	2 / 6	154,600	Sheared off end of locking arm.

DREXEL COUPLER.

6108	3 / 7	120,500	Upper lug 1″ in front of hinge-pin hole.

GOULD COUPLER.

6078	4 / 5	86,850	Lower lug.

HINSON COUPLER.

6142	5 / 8	98,700	Lower lug of drawbar through hinge-pin hole.

JANNEY COUPLER.

6113	6 / 8	71,400	Under 66,100 pounds knuckles slipped past each other and uncoupled. Again adjusted in the machine with emery cloth between knuckles to increase friction against uncoupling. Upper lug of No. 6 opened a fracture at angle of lug and tongue; a slight crack developed in lower lug of No. 8 at the same place. A crack also opened in the upper lug of No. 6 at the link-pin hole.

JOHNSON COUPLER.

No. of test.	No. of coupler.	Ultimate strength.	Fractured.
6148	2 3	*Pounds*, 56,900	Lugs of drawbar.

LUDLOW COUPLER.

6093	2 4	50,800	Knuckle at hinge-pin hole.

NATIONAL COUPLER.

6088	6 7	127,100	At 103,700 pounds sheared hinge pin. New pin put in and test resumed. Fractured upper lug at hinge-pin hole.

RIVERS COUPLER.

6153	1 8	119,200	Knuckle at angle.

STANDARD COUPLER.

6123	3 5	106,000	Tongue of knuckle.

ST. LOUIS COUPLER.

6075	6 7	116,100	Lug in front of hinge-pin hole. Coarse granular appearance.

THURMOND COUPLER.

6076	5 7	113,700	Under 111,000 pounds the knuckles slipped past each other. A crack was started in the knuckle of No. 7 at the side over which the other knuckle slipped. Again adjusted in the machine with emery cloth between knuckles to increase friction between surfaces. Knuckle from coupler No. 4 placed in No. 5.
6077	5 7	107,600	The first fracture of the knuckle broke off upper lug in front of hinge-pin hole. Appearance fine granular; near center there was a spongy spot 1″ by 1¼″. The second fracture took place through the metal to the hinge-pin hole.

TROJAN COUPLER.

6128	2 4	98,500	Hinge pin bent and allowed couplers to spring apart.

UNITED STATES COUPLER.

[Both locks wedged before testing.]

6133	2 7	137,100	Upper lug between hinge-pin hole and coupling-link hole.

CAR COUPLERS—DRAWBAR TESTS.

AMERICAN COUPLER.

No. of test.	No. of coupler.	Ultimate strength.	Fractured.
		Pounds.	
6155	3	164,800	Hinge pin sheared. Drawbar not fractured.
6156	2	219,900	Upper lug at hinge-pin hole. Started a crack in head near junction with shank.

BROWN EMERGENCY LINK COUPLER.

6164	4	139,900	Lower lug at hinge-pin hole.

BUCKEYE COUPLER.

6158	8	125,800	Upper lug at hinge-pin hole.

CALIFORNIA COUPLER.

6163	3	229,500	Lower lug at hinge-pin hole.

CHICAGO COUPLER.

6167	4	209,500	Upper lug at hinge-pin hole; also started a fracture in lower lug at same place.

DREXEL COUPLER.

6166	5	214,100	The special attachment fractured, and pin sheared. The drawbar lugs were bent outward about 25 degrees. Bar not fractured.

GOULD COUPLER.

6157	4	120,480	Lower lug at hinge-pin hole.

HINSON COUPLER.

6161	5	135,100	Shank 1″ to 3½″ from yoke block.

JANNEY COUPLER.

6154	3	135,200	Lower lug of bar at hinge-pin hole. Sheared 1⅛″ hinge pin in upper lug.

JOHNSON COUPLER.

6160	3	117,100	One lug, about 3″ from center of hinge-pin hole.

LUDLOW COUPLER.

6165	7	79,950	Shank, 2½″ from end.

NATIONAL COUPLER.

No. of test.	No. of coupler.	Ultimate strength.	Fractured.
		Pounds.	
6168	5	224,900	Head near junction with shank.

ST. LOUIS COUPLER.

6169	5	135,700	Upper lug at hinge-pin hole. A fracture also started in the lower lug at the junction of the lug and head.

THURMOND COUPLER.

6170	5	102,600	Lugs across hinge-pin holes.
6171	4	112,100	Shank, 8½" from end.

TROJAN COUPLER.

6159	4	143,600	Shank of drawbar, 10" from end.

UNITED STATES COUPLER.

6162	2	226,800	Upper lug at hinge-pin hole.

SUMMARIZED TABULATION OF CAR-COUPLER TESTS.

Name of coupler.	Number of pairs tested.	Average weights.		Tensile strength.					Single-lug tests.	Drawbar test.
		Couplers complete.	Knuckles.	First pair.	Second pair.	Third pair.	Fourth pair.	Average.		
		Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds.*
American	4	224.9	52.3	146,300	157,400	156,800	153,300	153,450	135,000	219,900
Brown Emergency Link	4	229.5	36.8	147,720	133,900	149,200	145,300	144,030	99,500	139,900
Buckeye	4	224.5	58.1	163,180	139,000	147,000	170,600	154,945	133,400	125,800
California	4	223.6	35.4	126,800	117,100	119,900	130,100	123,475	70,000	229,500
Chicago	4	219.1	53.3	195,200	169,700	185,600	171,100	180,400	154,600	209,500
Drexel	4	201.3	57.9	161,600	147,900	146,000	153,700	152,300	120,500	214,100
Gould	3	203.3	36.9	129,100	129,900	137,580	.....	132,193	86,850	120,480
Hinson	4	218.7	53.2	125,000	138,200	112,400	124,400	125,000	98,700	135,100
Janney	4	215.4	37.5	91,300	84,150	93,400	92,800	90,413	71,400	135,200
Johnson	4	176.6	35.8	49,800	83,100	79,300	75,000	71,800	56,900	117,100
Ludlow	4	222.4	68.8	67,600	68,100	80,800	61,000	69,375	50,800	79,950
Nationala	4	213.7	49.9	135,400	155,400	128,300	168,600	146,925	127,100	224,900
Rivers	4	254.8	82.1	61,300	143,400	120,000	141,200	118,725	119,200	.....
Standard	4	221.9	66.7	149,400	164,800	153,100	164,500	157,950	106,000	.....
St. Louis	4	211.9	61.2	134,000	123,700	146,900	124,000	132,150	116,100	135,700
Thurmond	4	205.1	50.8	145,000	131,900	106,100	137,500	130,125	107,600	112,100
Trojan	4	216.5	52.3	125,000	136,000	134,300	136,100	132,850	98,500	143,600
United States	4	243.3	70.6	108,000	133,800	116,000	148,800	126,650	137,100	226,800

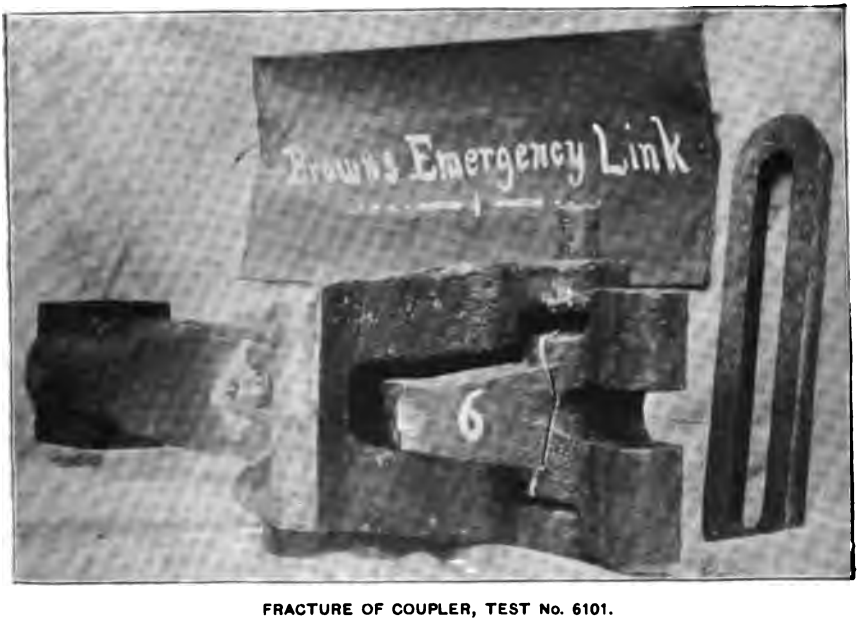
a Formerly called "Perfected."

FRACTURE OF COUPLER, TEST No. 6116.

FRACTURE OF COUPLER, TEST No. 6117.

AMERICAN COUPLERS.

FRACTURE OF COUPLER TEST No. 6099.

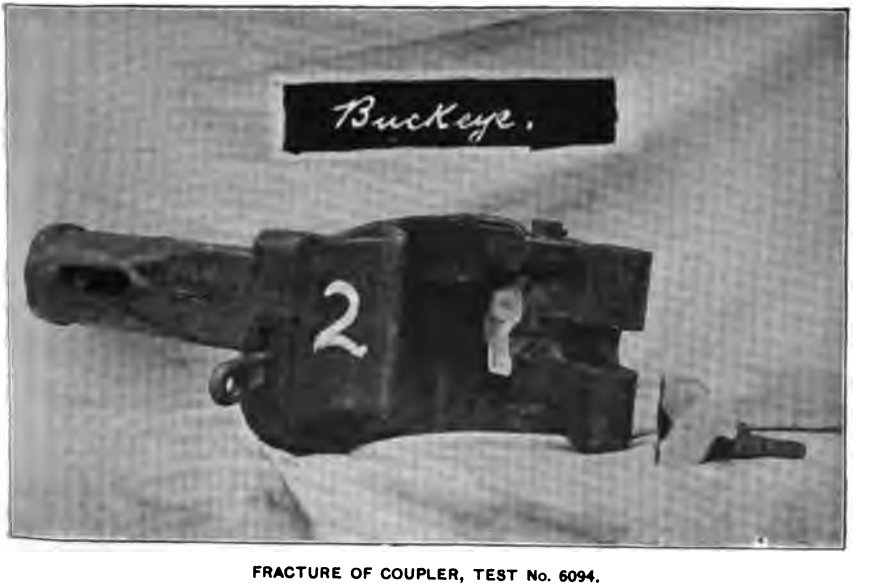


FRACTURE OF COUPLER, TEST No. 6101.

BROWN'S EMERGENCY LINK COUPLERS.

FRACTURE OF COUPLER, TEST No. 6102.

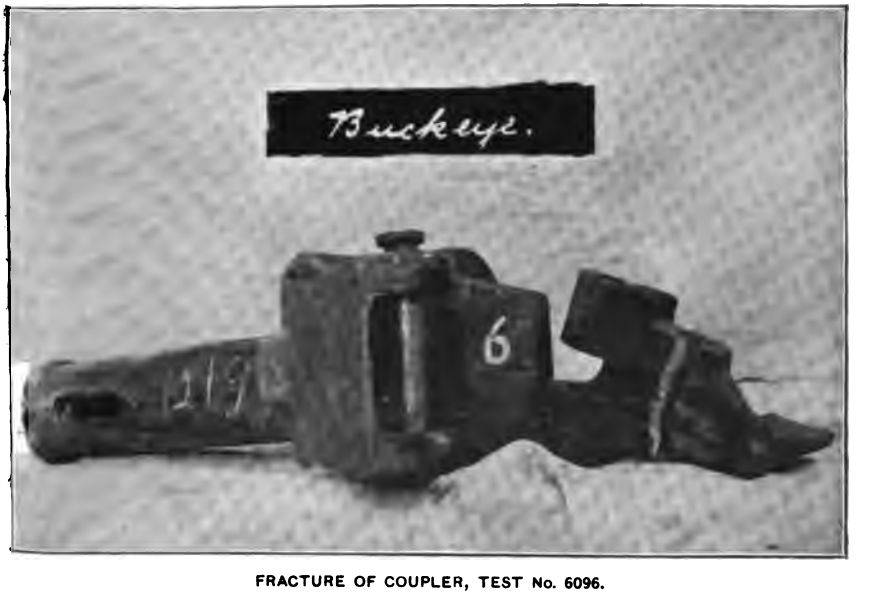
BROWN'S EMERGENCY LINK COUPLER.



FRACTURE OF COUPLER, TEST No. 6094.

BUCKEYE COUPLER.

FRACTURE OF COUPLER, TEST No. 6095.



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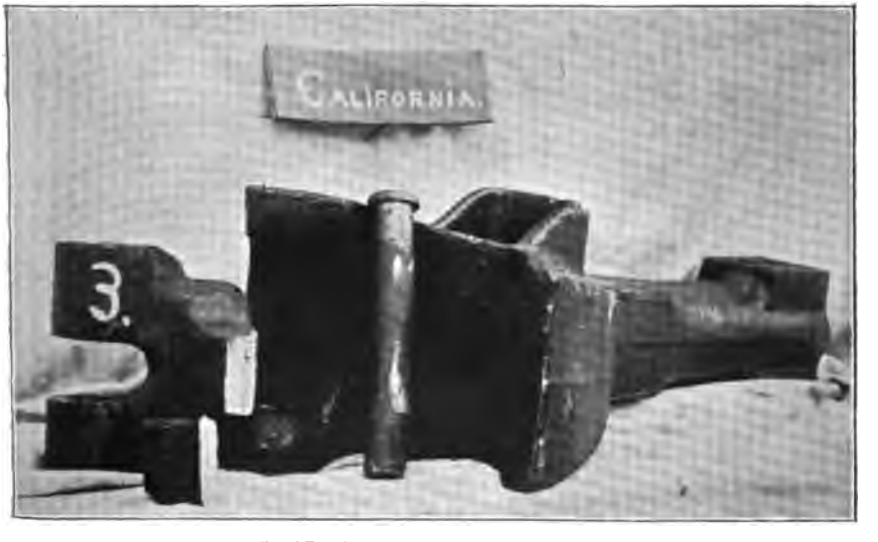
BUCKEYE COUPLERS.

FRACTURE OF COUPLER, TEST No. 6097.

BUCKEYE COUPLER.



FRACTURE OF COUPLER, TEST No. 6135.

CALIFORNIA COUPLER.

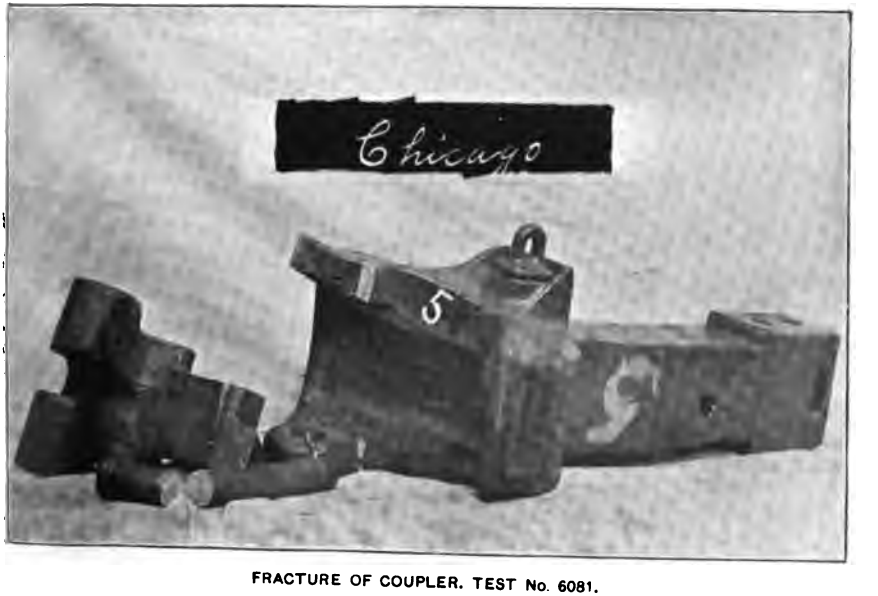
FRACTURE OF COUPLER, TEST No. 6136.

CALIFORNIA COUPLER.

FRACTURE OF COUPLER, TEST No. 6079.

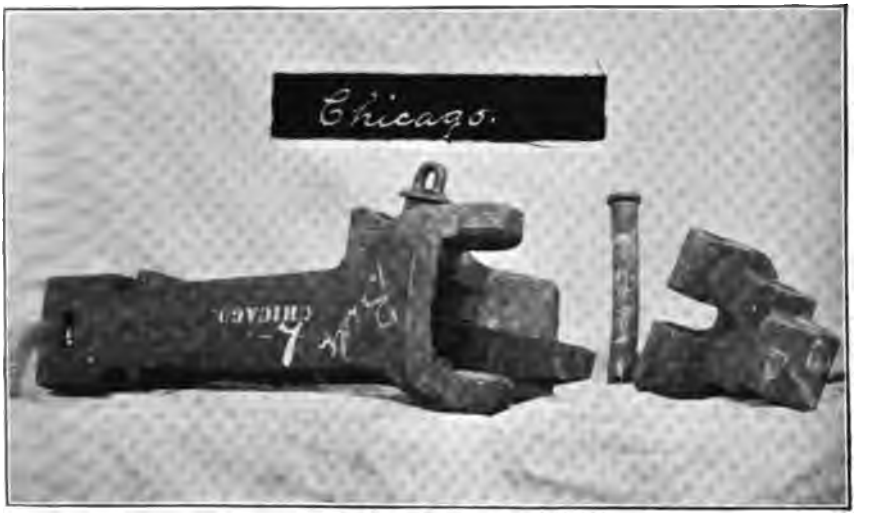
CHICAGO COUPLER.

FRACTURE OF COUPLER, TEST No. 6080.



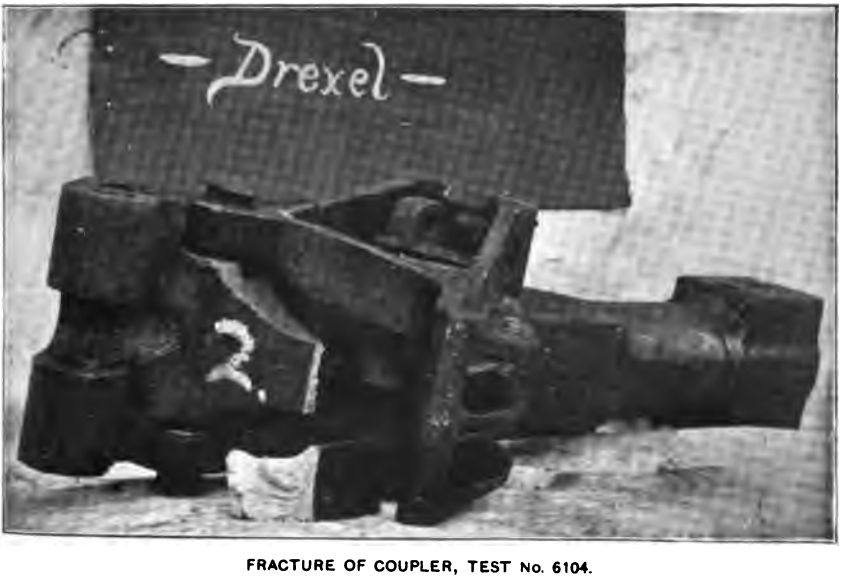
FRACTURE OF COUPLER. TEST No. 6081.

CHICAGO COUPLERS.



FRACTURE OF COUPLER, TEST No. 6082.

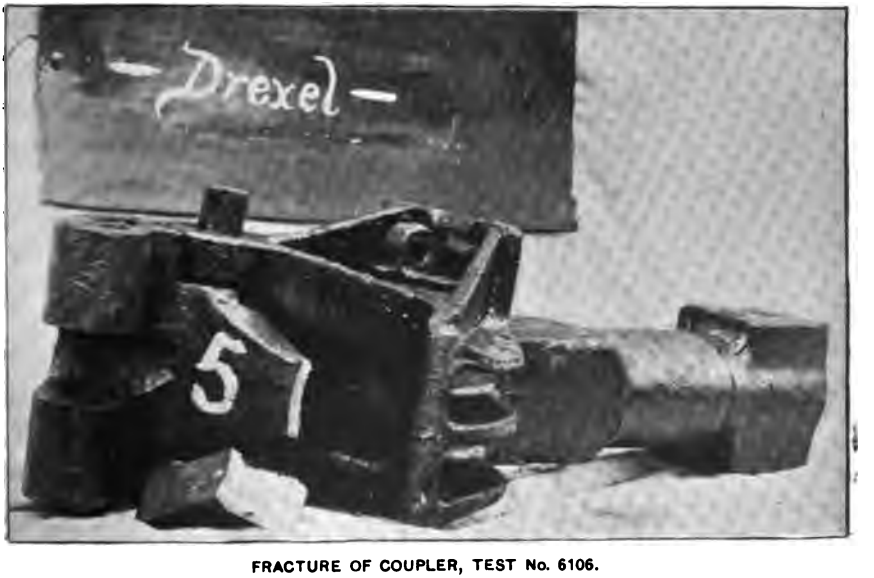
CHICAGO COUPLER.



FRACTURE OF COUPLER, TEST No. 6104.

DREXEL COUPLER.

FRACTURE OF COUPLER, TEST No. 6105.

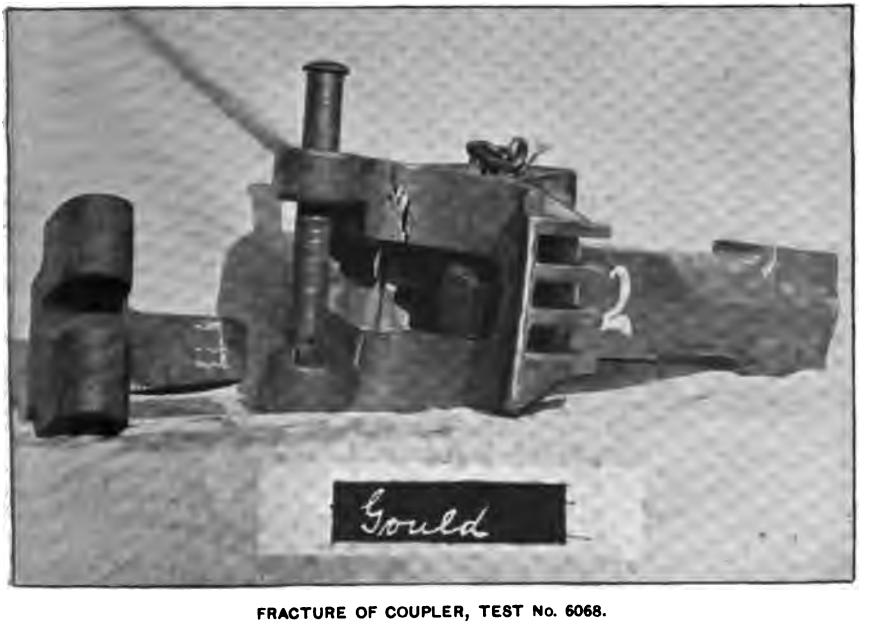


FRACTURE OF COUPLER, TEST No. 6106.

DREXEL COUPLERS.

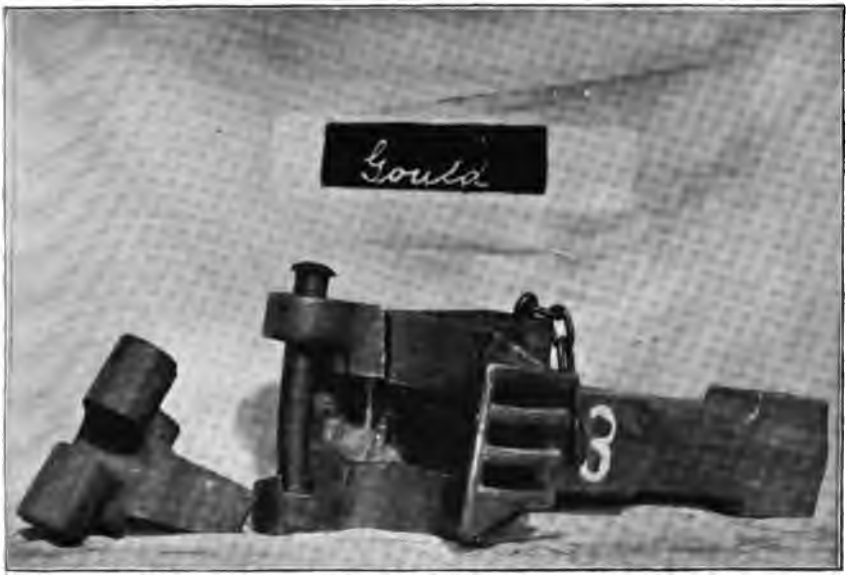
FRACTURE OF COUPLER, TEST No. 6107.

DREXEL COUPLER.



FRACTURE OF COUPLER, TEST No. 6068.

GOULD COUPLER.



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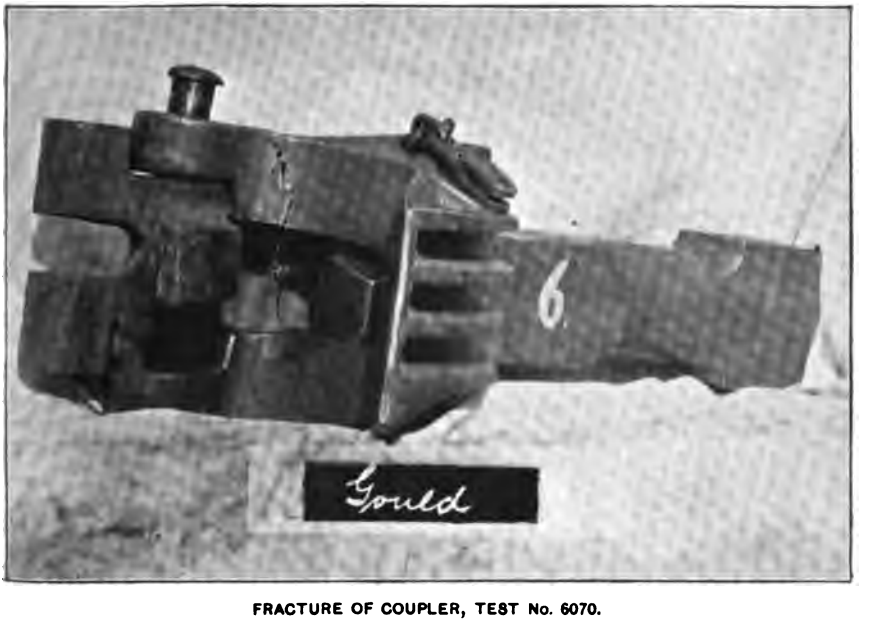
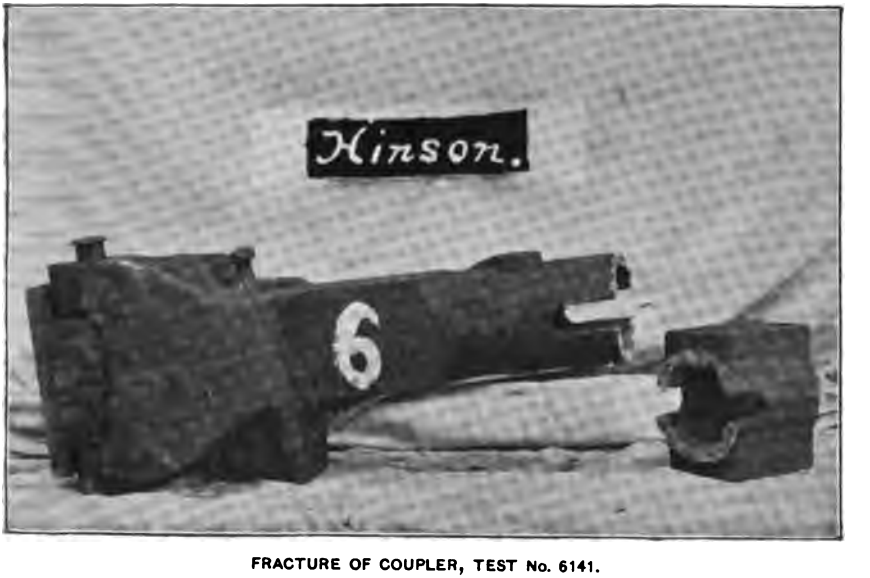


FRACTURE OF COUPLER, TEST No. 6070.

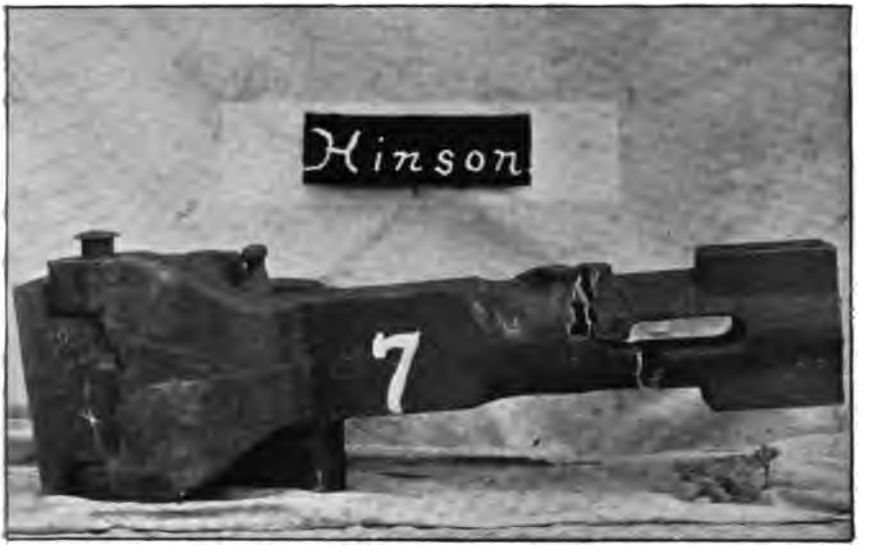
GOULD COUPLERS.

FRACTURE OF COUPLER, TEST No. 6139.



FRACTURE OF COUPLER, TEST No. 6141.

HINSON COUPLERS.

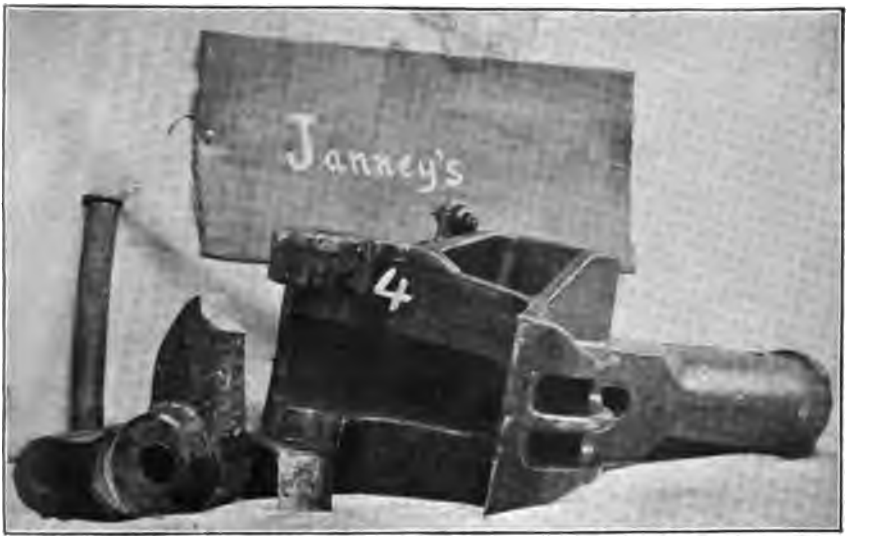


FRACTURE OF COUPLER, TEST No. 6142.

HINSON COUPLER.

FRACTURE OF COUPLER, TEST No. 6109.

JANNEY COUPLER.



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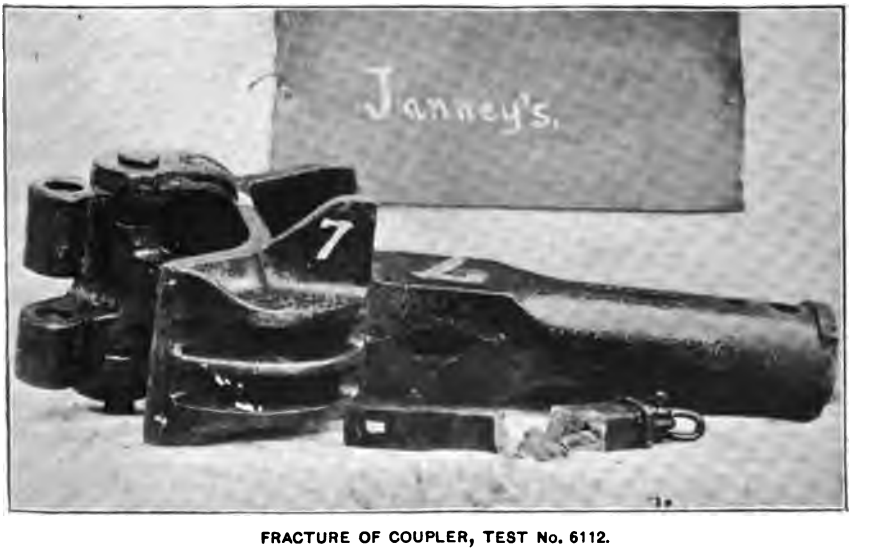
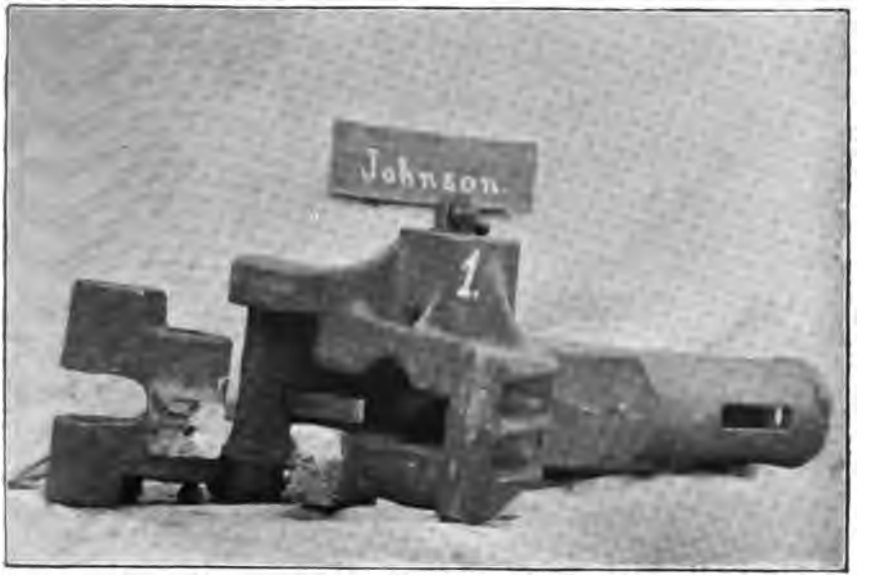


FRACTURE OF COUPLER, TEST No. 6112.

JANNEY COUPLERS.



FRACTURE OF COUPLER, TEST No. 6144.

FRACTURE OF COUPLER, TEST No. 6146.

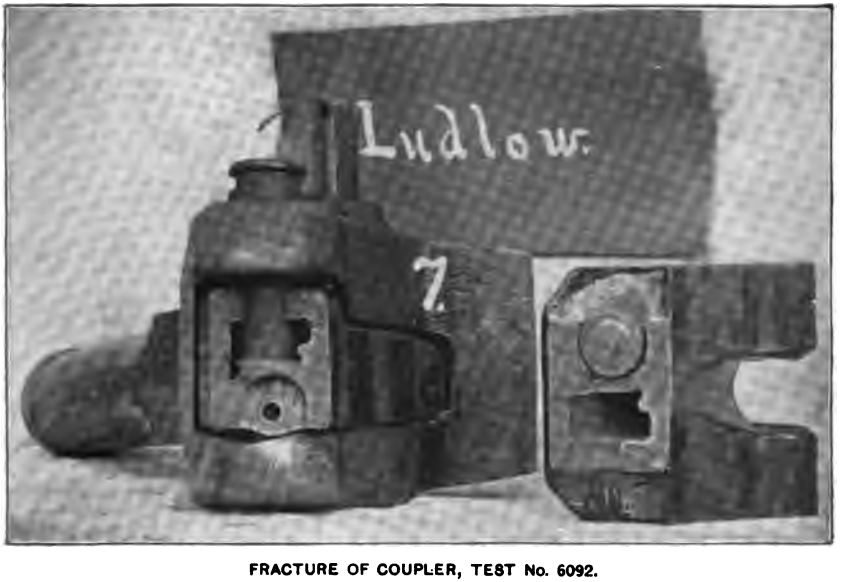
JOHNSON COUPLERS.

FRACTURE OF COUPLER, TEST No. 6089.

FRACTURE OF COUPLER, TEST No. 6090.

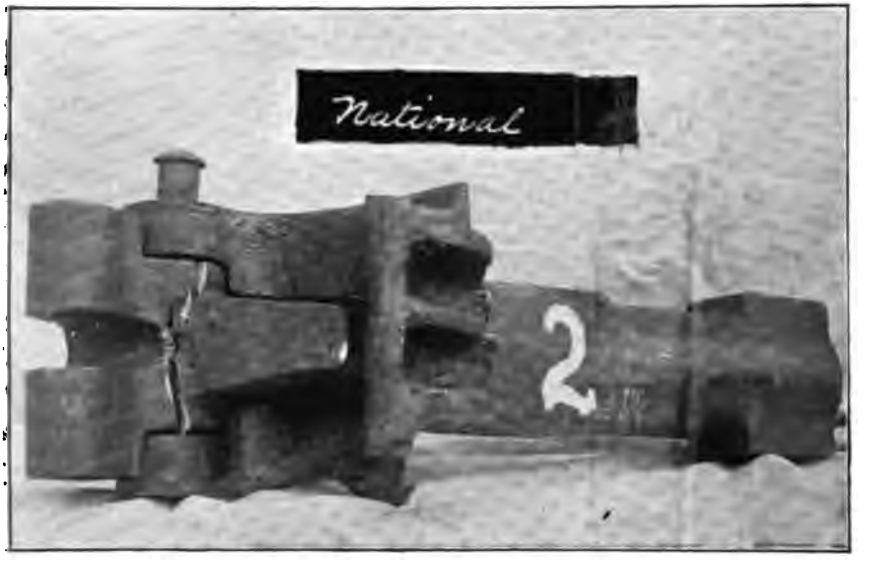
LUDLOW COUPLERS.

FRACTURE OF COUPLER, TEST No. 6091.

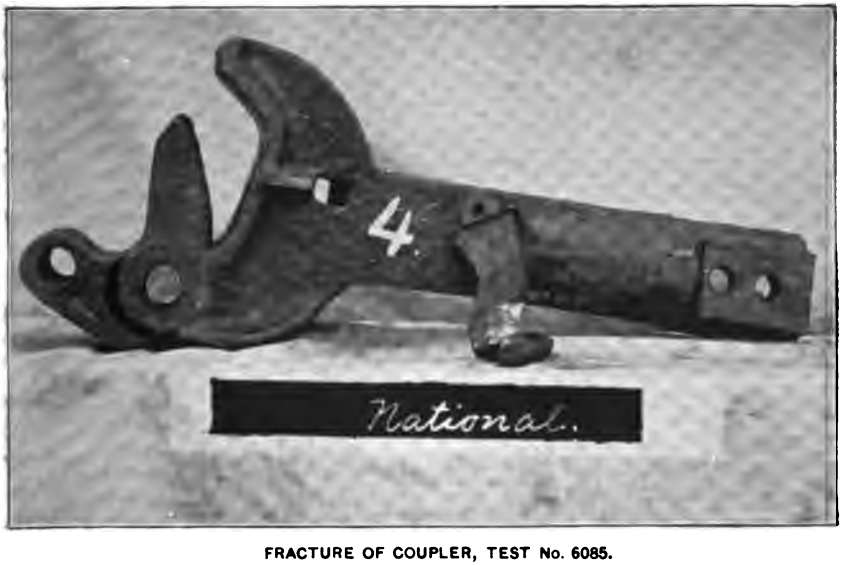


FRACTURE OF COUPLER, TEST No. 6092.

LUDLOW COUPLERS.

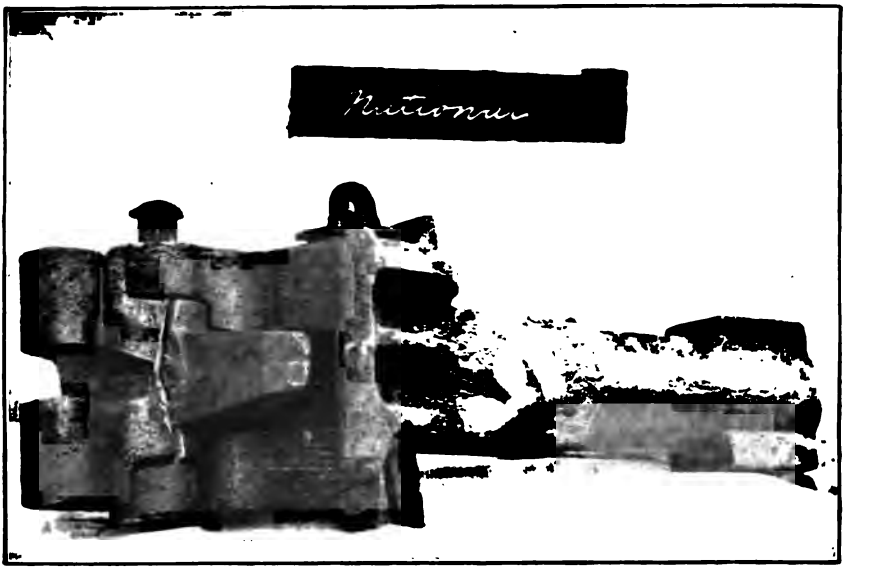


FRACTURE OF COUPLER, TEST No. 6084.



FRACTURE OF COUPLER, TEST No. 6085.

NATIONAL COUPLERS, FORMERLY CALLED "PERFECTED."



FRACTURE OF COUPLER, TEST No. 6086.

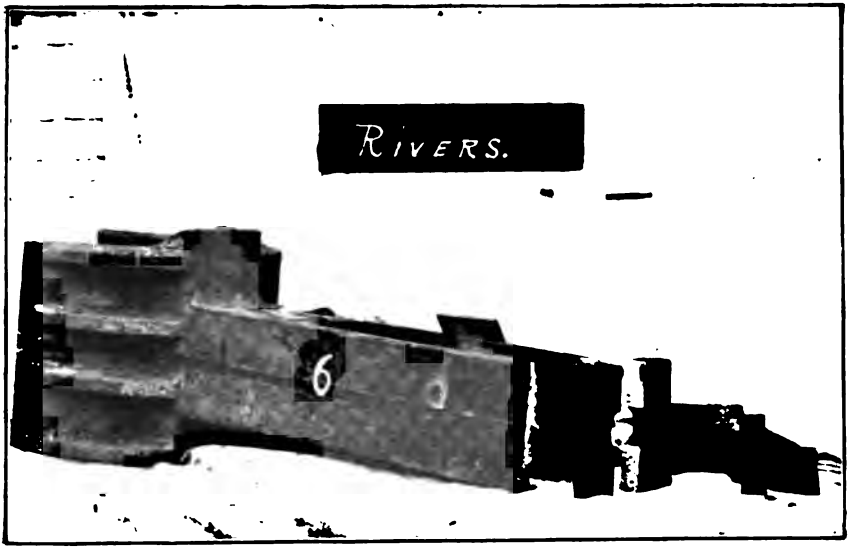
FRACTURE OF COUPLER, TEST No. 6087.

NATIONAL COUPLERS, FORMERLY CALLED "PERFECTED."

FRACTURE OF COUPLER, TEST No. 6149.

FRACTURE OF COUPLER, TEST No. 6150.

RIVERS COUPLERS.

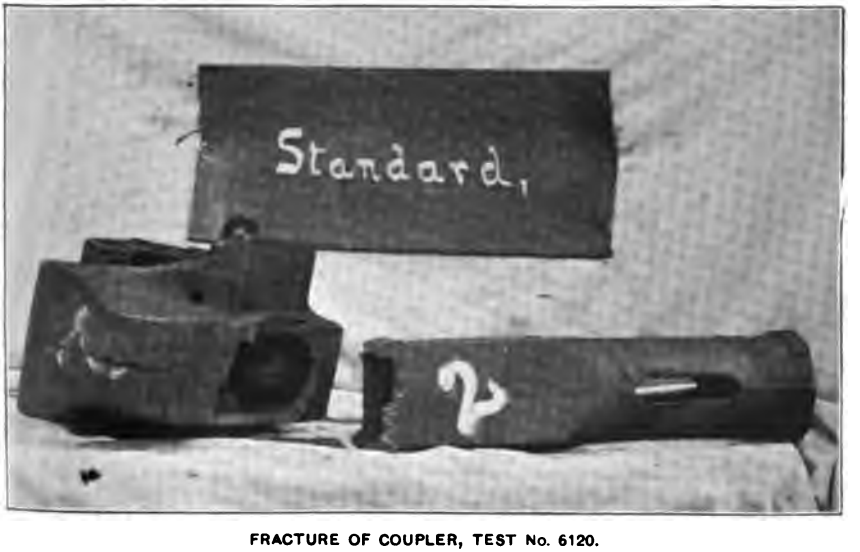


FRACTURE OF COUPLER, TEST No. 6151.

FRACTURE OF COUPLER, TEST No. 6151.

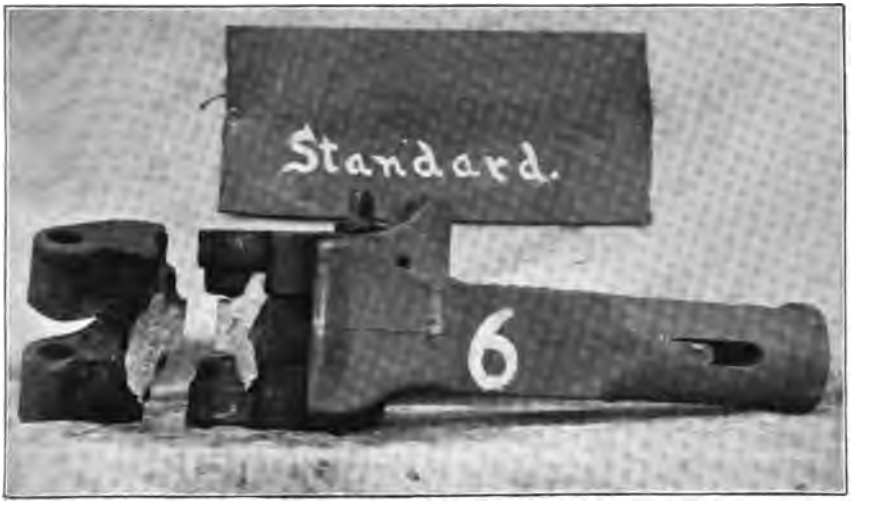
RIVERS COUPLERS.

FRACTURE OF COUPLER, TEST No. 6119.



FRACTURE OF COUPLER, TEST No. 6120.

STANDARD COUPLERS.



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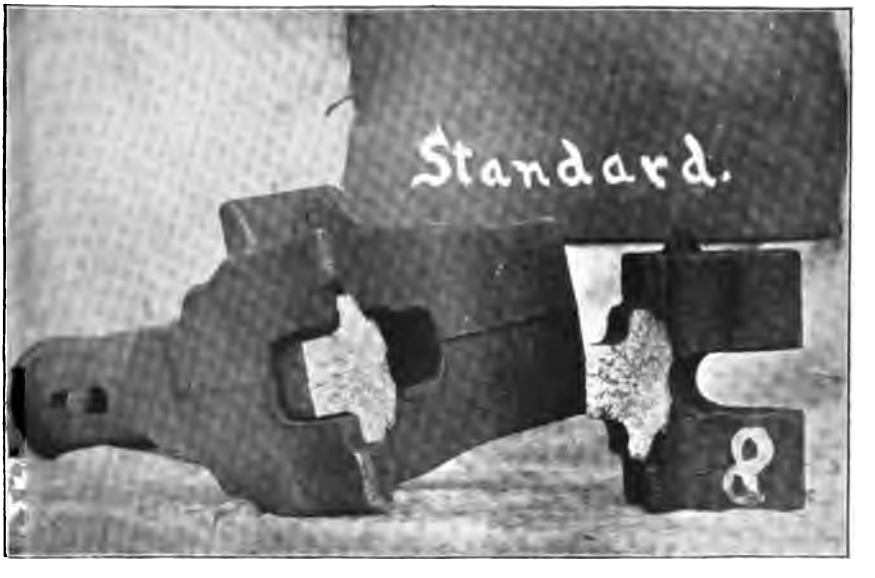

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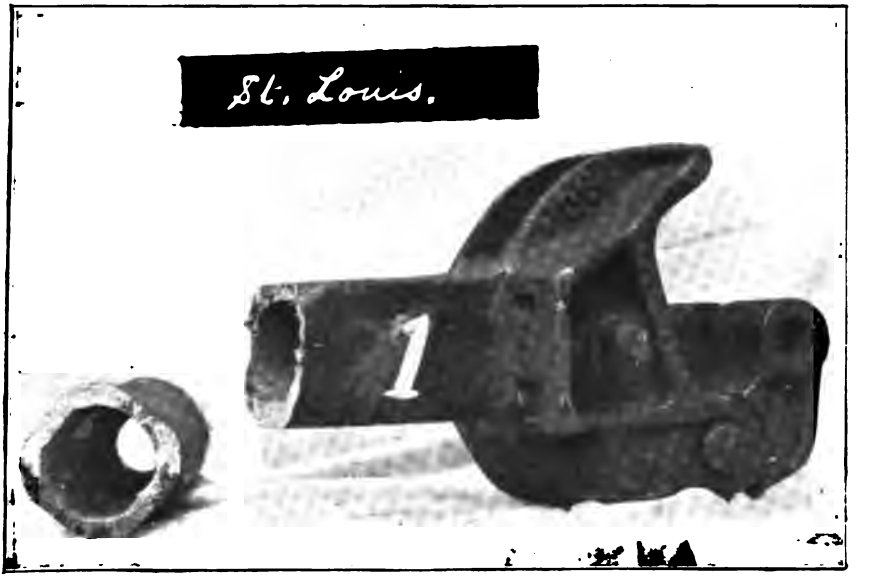
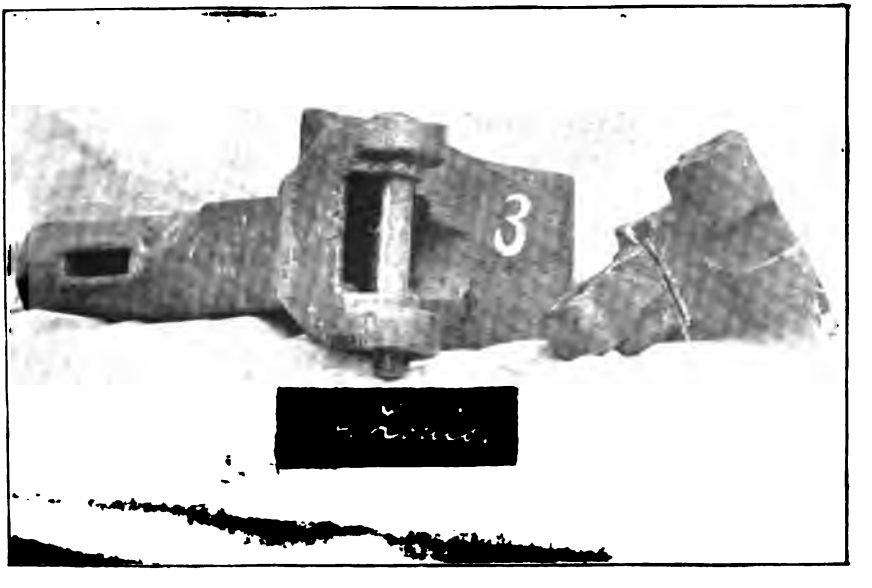
STANDARD COUPLERS.



FRACTURE OF COUPLER, TEST No. 6071.



FRACTURE OF COUPLER, TEST No. 6072.

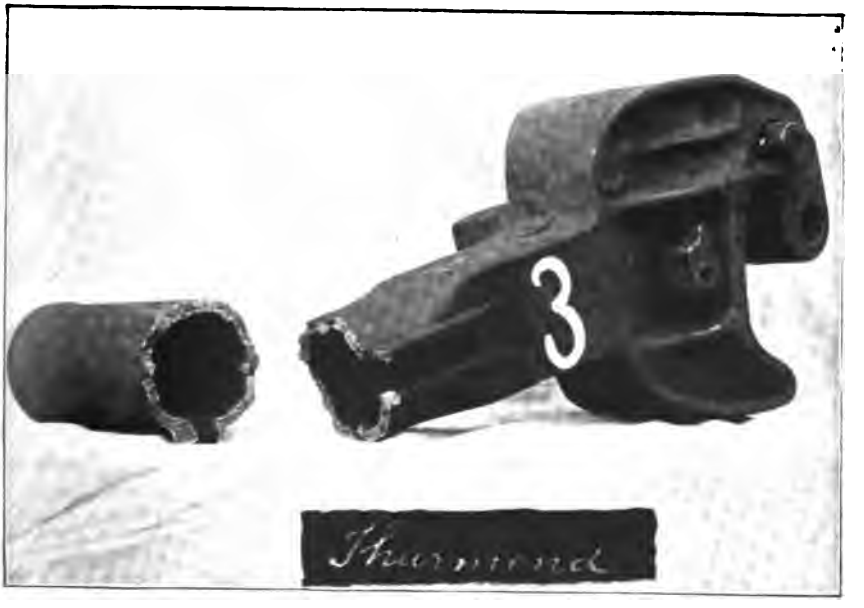
ST. LOUIS COUPLERS.

FRACTURE OF COUPLER, TEST No. 6073.

FRACTURE OF COUPLER, TEST No. 6074.

ST. LOUIS COUPLERS.

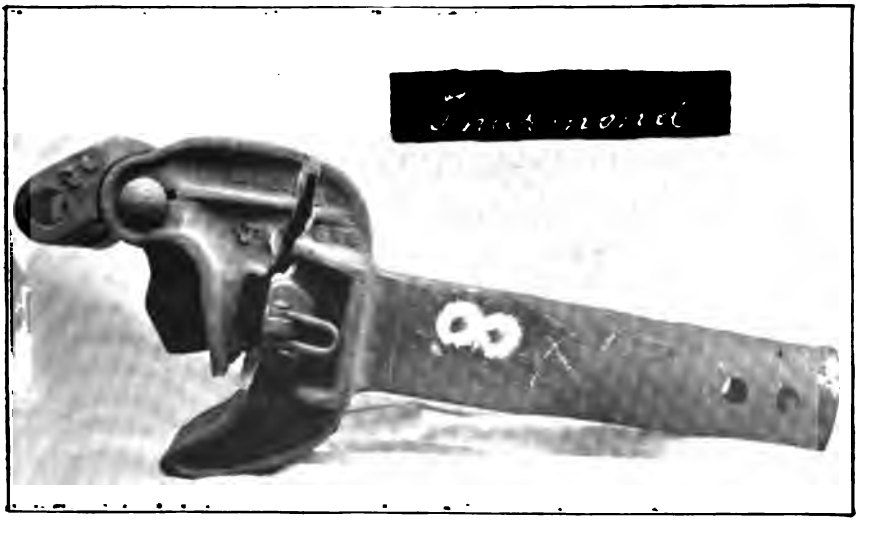
FRACTURE OF COUPLER, TEST No. 6064.



FRACTURE OF COUPLER, TEST No. 6065.

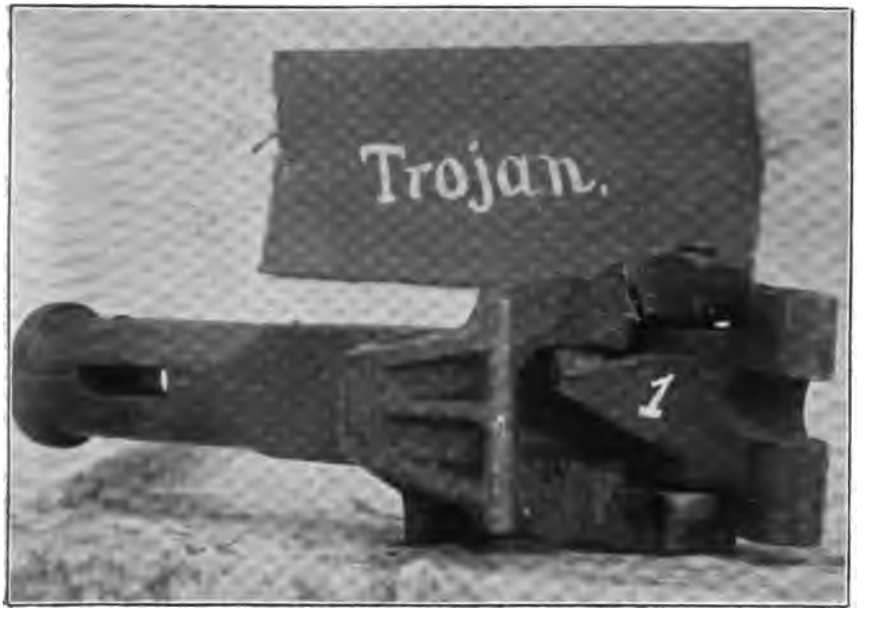
THURMOND COUPLERS.

FRACTURE OF COUPLER, TEST No. 6066.



FRACTURE OF COUPLER, TEST No. 6067.

THURMOND COUPLERS.



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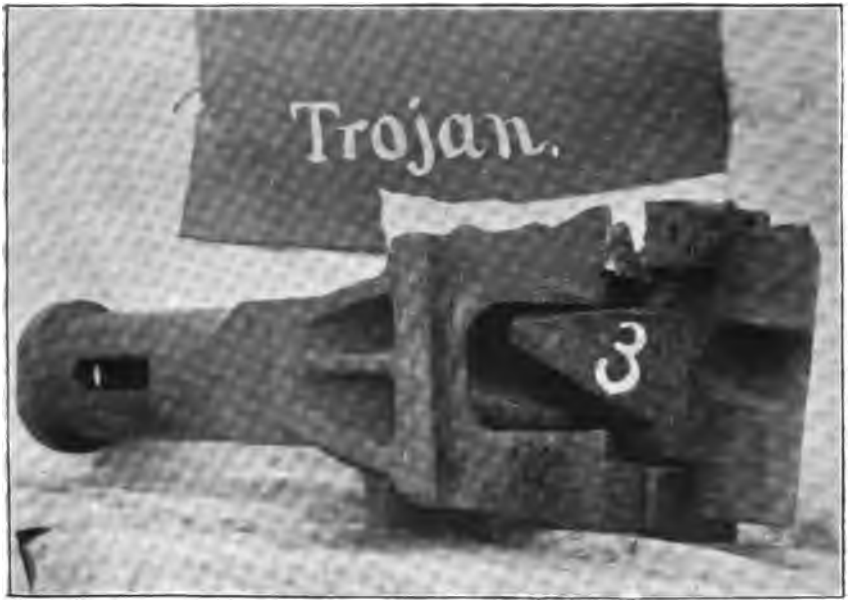


FRACTURE OF COUPLER, TEST No. 6125.

TROJAN COUPLERS.

FRACTURE OF COUPLER, TEST No. 6126.

FRACTURE OF COUPLER, TEST No. 6127.

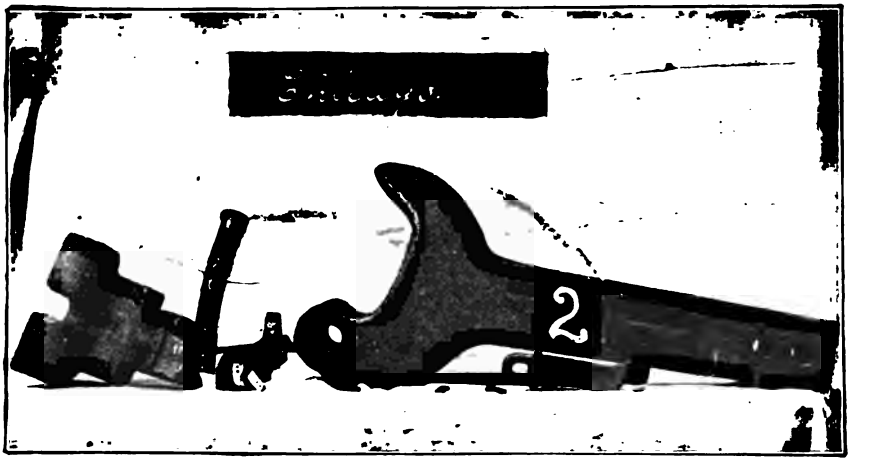
TROJAN COUPLER.

FRACTURE OF COUPLER, TEST No. 6129.

UNITED STATES COUPLER.

FRACTURE OF SINGLE LUG, TEST No. 6098.

BUCKEYE COUPLER.



FRACTURE OF SINGLE LUG, TEST No. 6083.

CHICAGO COUPLER.

FRACTURE OF SINGLE LUG, TEST No. 6108.

DREXEL COUPLER.

FRACTURE OF SINGLE LUG, TEST No. 6078.

GOULD COUPLER.

FRACTURE OF SINGLE LUG, TEST No. 6113.

JANNEY COUPLER.

FRACTURE OF SINGLE LUG, TEST No. 6093.

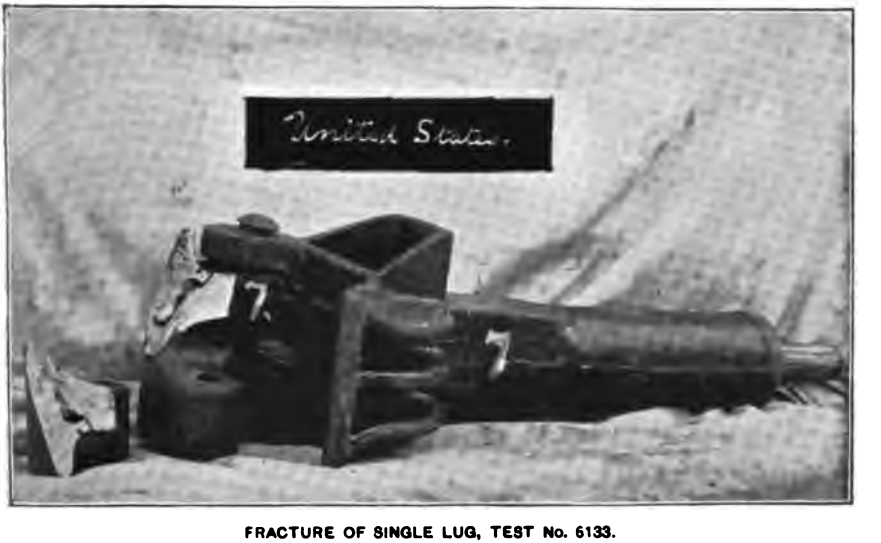
LUDLOW COUPLER.

FRACTURE OF SINGLE LUG, TEST No. 6088.

NATIONAL COUPLER, FORMERLY CALLED "PERFECTED."

FRACTURE OF SINGLE LUG, TEST No. 6075.

ST. LOUIS COUPLER.



FRACTURE OF SINGLE LUG, TEST No. 6133.

UNITED STATES COUPLER.

CHAIN CABLE, SHACKLES, AND SWIVELS.

TESTS OF CHAIN CABLE FOR THE UNITED STATES LIGHT-HOUSE INSPECTOR, THIRD DISTRICT.

No. of test.	Marks.	Diameters.			Sectional area of chain.	Tensile strength.		Fracture.
		End links.	Outside studded links.	Studded links of chain.		Total.	Per square inch.	
		Inches.	*Inches.*	*Inches.*	*Sq. ins.*	*Pounds.*	*Pounds.*	
5911	"Bradlee & Co., Philada"	.....	1.94	1.79	5.03	186,200	37,020	First link of chain in the quarter. Granular, 60 per cent; fibrous, 40 per cent.
5912	.....do	.....	1.94	1.79	5.03	193,900	38,550	First link of chain in the quarter. Fibrous, slightly granular.
5983	.....do	.....	1.90	1.77	4.92	201,970	41,050	Middle link in the quarter. Fibrous.
5984	.....do	.....	1.88	1.77	4.92	211,940	43,080	First link of chain in the quarter. Fibrous.
5985	.....do	.....	1.90	1.76	4.86	205,500	42,280	Middle link in the quarter. Fibrous.
5894	.....do	2.27	2.03	1.92	5.70	210,200	36,300	Middle link in two places at alternate quarters. Both fractures granular.
5895	.....do	2.28	2.00	1.94	5.91	217,400	36,790	Middle link in the quarter. Fibrous.
5896	.....do	2.25	1.99	1.90	6.03	224,200	37,180	Middle link at the weld in the quarter with a fibrous appearance, 10 per cent granular.
5930	.....do	.....	2.04	1.91	5.73	216,680	37,810	First link of chain in the quarter. Fibrous.
5931	.....do	.....	2.04	1.90	5.67	233,970	41,260	Middle link in the quarter. Fibrous.
5932	.....do	.....	2.04	1.89	5.61	214,700	38,270	First link of chain at the end. Fibrous.
5980	.....do	.....	2.03	1.88	5.55	222,240	40,040	Outside studded link in the side. Links of chain not fractured.
5981	.....do	.....	2.03	1.89	5.61	230,960	41,170	Middle link in the quarter. Fibrous.
5982	.....do	.....	2.02	1.88	5.55	228,750	41,220	First link of chain in the quarter.
5889						249,600	38,170	Outside studded link.
5889a	.....do	2.34	2.14	2.04	6.54	252,000	38,530	Other outside studded link.
5889b						251,300	38,430	First link of chain in the quarter, opposite welded end.
5890	.....do	2.36	2.14	2.04	6.54	249,600	38,170	First link of chain in the quarter with a fibrous appearance, and at the opposite side with a granular appearance; the granular fracture thought to be secondary.
5891	.....do	2.34	2.12	2.01	6.35	239,000	37,640	Middle link of chain in the side at the weld.
5907	.....do	.....	2.18	2.00	6.28	247,100	39,350	First link of chain across one end; surfaces 40 per cent fibrous, 60 per cent granular.
5908	.....do	.....	2.17	2.01	6.35	239,900	37,780	Middle link at the welded quarter. Fibrous, 40 per cent; granular, 60 per cent.
5909	.....do	.....	2.17	2.01	6.35	238,400	37,540	Middle link in the quarter. Granular.
5910	.....do	.....	2.17	2.01	6.35	241,280	38,000	First link of chain at the side. Followed the scarf of the weld 60 per cent; granular, 40 per cent.
5924	.....do	.....	2.14	2.06	6.66	245,600	36,880	Middle link in the quarter. Fibrous, 60 per cent; granular, 40 per cent.
5925	.....do	.....	2.15	2.07	6.73	251,300	37,340	Middle link in the quarter. Fibrous, 60 per cent; granular, 40 per cent.
5926	.....do	.....	2.15	2.06	6.66	256,950	38,580	Middle link at the end. Fibrous.
5927	.....do	.....	2.15	2.04	6.54	269,520	41,210	Outside link in the quarter. Fibrous.
5928	.....do	.....	2.14	2.06	6.66	268,850	40,370	Middle link in the quarter. Fibrous, 60 per cent; granular, 40 per cent.
5929	.....do	.....	2.14	2.04	6.54	266,680	40,780	Outside link in the quarter. Fibrous.
5974	.....do	.....	2.14	2.02	6.40	257,740	40,270	First link of chain in the quarter. Fibrous.
5975	.....do	.....	2.12	2.03	6.47	261,100	40,360	First link of chain in the side. Followed scarf of weld in part, and in par. fibrous.
5976	.....do	.....	2.14	2.01	6.35	229,980	36,220	First link of chain in the quarter. Fibrous.

Tests of chain cable for the United States light-house inspector, third district—Continued.

No. of test.	Marks.	Diameters.			Sectional area of chain.	Tensile strength.		Fracture.
		End links.	Outside studded links.	Studded links of chain.		Total.	Per square inch.	
		Inches.	*Inches.*	*Inches.*	*Sq ins.*	*Pounds.*	*Pounds.*	
5977	"Bradlee & Co., Philada"	.....	2.15	2.05	6.60	252,700	38,290	First link of chain in the quarter. Fibrous.
5978	.....do	.....	2.14	2.05	6.60	236,150	35,780	First link of chain in the side. Followed the scarf of the weld in part, and in part granular.
5979	.....do	.....	2.13	2.05	6.60	253,480	38,410	Middle link in the side. Followed the scarf of the weld in part. At one end of the scarf fibrous; at the other end granular.
6019	.....do	.....	2.16	2.04	6.54	271,200	41,470	Middle link in the quarter. Fibrous.
6020	.....do	.....	2.16	2.03	6.47	260,500	40,260	First link of chain in the quarter. Fibrous.
6021	.....do	.....	2.16	2.04	6.54	253,600	38,780	Middle link at weld. Followed scarf.
6022	.....do	.....	2.15	2.04	6.54	257,300	39,340	Outside studded link at weld. Followed scarf.
6023	.....do	.....	2.15	2.03	6.47	254,100	39,270	Middle link at end. Fibrous.
6024	.....do	.....	2.16	2.03	6.47	259,400	40,090	First link of chain in the quarter. Fibrous.
6054	.....do	.....	2.10	2.04	6.54	240,180	36,720	First link of chain at the side. Followed scarf of weld.
6055	.....do	.....	2.11	2.03	6.47	250,600	38,730	First link of chain in the quarter. Fibrous.
6056	.....do	.....	2.11	2.04	6.54	247,950	37,910	Middle link of chain at the side. Followed scarf of weld.
6057	.....do	.....	2.09	2.03	6.47	252,180	38,980	Outside link in the side. Followed scarf of weld.
6172	.....do	.....	2.10	2.00	6.28	246,900	39,320	Outside link.
6172a						271,150	43,180	Link of chain, next the remaining outside link, in the quarter. Fibrous.
6173	.....do	.....	2.12	2.00	6.28	254,300	40,490	First link of chain in the quarter. Fibrous.
6199	.....do	.....	2.12	2.01	6.35	251,600	39,620	Do.
6200	.....do	.....	2.10	2.01	6.35	247,900	39,040	Outside link in the side. Followed the scarf of weld.
6200a						266,100	41,920	Link of chain, next the remaining outside link, in the quarter. Fibrous.

TESTS OF SHACKLES AND SWIVELS FOR UNITED STATES LIGHT-HOUSE INSPECTOR, THIRD DISTRICT.

No. of test.	Description.	Tensile strength.	Fractured.
		Pounds.	
5914	1¼" shackle	243,100	Eye of shackle, one side, carrying tongue.
5898	1½" shackle	238,200	Outside studded link 2".06 diameter in the side at weld.
5898*a*	1½" shackle	239,500	Other outside studded link in the side at weld. Shackle not fractured.
5893	2" shackle	294,100	End link of chain at side weld.
5913	1¾" swivel	235,400	Pulled off head of stem of swivel.
5920	1⅞" swivel	99,800	Bale of socket end. Fibrous.
5921	1⅞" swivel	125,800	Do.
5897	1½" swivel	243,300	Outside studded link in the quarter.
5897*a*	1½" swivel	241,500	Pulled off head of stem of swivel.
5892	2" swivel	256,800	Do.

CHAIN CABLE AND CHAIN IRON FROM BOSTON NAVY-YARD.

TESTS OF CHAIN CABLE.

No. of test.	Marks.		Diameters.		Sectional area of chain.	Tensile strength.		Fracture.
	End links.	Links of chain.	Unstudded end links.	Studded links of chain.		Total.	Per square inch.	
			Inches.	*Inches.*	*Sq. in.*	*Pounds.*	*Pounds.*	
5866	.....	.....	2.72	2.48	9.66	298,600	30,910	End link at the weld.
6058	3	K-L-M	2.72	2.42	9.20	384,500	41,760	Middle link of chain, marked L, in the quarter at the welded end. Granular, 40 per cent; fibrous, 60 per cent.
6059	4	H-I-J	2.72	2.46	9.50	329 200	34,650	Middle link, marked I, in the quarter at the welded end. Fibrous.
6060	8	5-6-7	2.72	2.45	9.43	377,600	40,040	First link of chain, marked 7, in the quarter. Granular, 30 per cent; fibrous, 70 per cent.
6174	.....	.....	2.73	2.47	9.58	272,500	28,440	End link in the quarter at weld.
6174*a*	.....	.....	.....	.....	.....	293,400	30,630	Link of chain next remaining end link. Followed the scarf of the weld.
6175	.....	D-F-E	2.72	2.46	9.50	287,200	30,230	End link at the welded end. There was a crack started in studded link D at the weld; also a seam 3½" long was opened in link D, the seam running parallel to the grain of the iron. In link F a similar seam was opened 7" long at the end of the link.
6175*a*	.....	.....	.....	.....	.....	284,300	29,930	Link D at the weld.

ELECTRICALLY WELDED SAMPLE.

No. 5865.

Sample consists of three links, the middle link an electrically welded steel link.

	Sq. inch.
Diameter of link=2″.52, sectional area	9.97
Diameter at welding burr=3″.05, sectional area	14.61

End links are of wrought iron and have 2″.67 and 2″.72 diameters, respectively.

At 302,800 pounds load end link fractured in the weld.

Steel link tested alone.

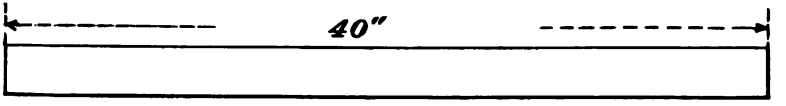
Tensile strength 384,700 pounds..... { 38,590 pounds per square inch on chain. / 26,330 pounds per square inch at weld.

Fractured across the weld at one side of the link; also through end of link.

Appearance of fracture granular. The fracture at the weld contained a smooth flaky spot about ¾″ by ½″.

The end fracture had a radiant appearance, the center of radiation being at the inside of the link.

TENSILE TESTS OF CHAIN IRON.



No. of test.	Mark on specimen.	Diameter.	Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 8 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.	Elongation of inch sections.							
				Total.	Per square inch.	Total.	Per square inch.													
		Inches.	*Sq. in.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Inches.*	*Per ct.*	*In. Sq. in.*	*P. ct.*		"	"	"	"	"	"	"	"
6030	I	2.53	5.03	142,100	28,250	258,100	51,310	2.52	31.5	Diam., 2.09=3.43	31.8	Fibrous, granular spots.	.27,	.23,	.27,	.25,	.36,	.52*,	.36,	.26
6031	II	2.53	5.03	144,600	28,750	260,900	51,850	2.09	26.1	Diam., 2.12=3.53	20.8	.....do.....	.21,	.24,	.23,	.22,	.25,	.26,	.29,	.39
6032	III	2.53	5.03	146,350	29,090	260,180	51,720	2.58	32.3	Diam., 2.09=3.43	31.8	.....do.....	.22,	.26,	.24,	.27,	.30,	.36,	.56*,	.37
6033	IV	2.53	5.03	142,300	28,290	256,190	50,930	2.48	31.0	Diam., 2.09=3.43	31.8	.....do.....	.28,	.24,	.28,	.26,	.25,	.31,	.48*,	.38
6034	V	2.53	5.03	139,300	27,640	254,400	50.580	2.51	31.4	Diam., 2.14=3.60	28.4	.....do.....	.28,	.27,	.33,	.42,	.45*,	.27,	.27,	.23
6035	VI	2.53	5.03	144,300	28,690	257,420	51,180	2.52	31.5	Diam., 2.05=3.30	34.4	.....do.....	.22,	.26,	.23,	.26,	.25,	.49*,	.48,	.33
6036	VII	2.56	5.15	162,500	31,550	274,200	53,240	1.98	24.8	Diam., 2.22=3.87	24.9	.... do.....	.19,	.20,	.19,	.21,	.22,	.26,	.35*,	.36*
6037	A	2.54	5.07	129,250	25,490	241,800	47,690	3.00	37.5	Diam., 1.94=2.96	41.6	Fibrous.....	.28,	.29,	.33,	.68*,	.52,	.33,	.30,	.27
6038	B	2.54	5.07	130,700	25,790	244,110	48,150	2.99	37.4	Diam., 1.96=3.02	40.4	Fibrous, seamy....	.29,	.24,	.29,	.35,	.54,	.62*,	.39,	.29
6039	C	2.53	5.03	126,680	25,180	238,690	47,450	3.22	40.3	Diam., 1.92=2.90	42.3	Fibrous	.28,	.26,	.34,	.37,	.58,	.67*,	.39,	.33
6040	D	2.53	5.03	127,400	25,330	243,380	48,390	3.09	38.6	Diam., 1.94=2.96	41.1	.....do.....	.25,	.27,	.31,	.40,	.68*,	.50,	.37,	.31
6041	E	2.52	4.99	123,100	24,670	237,140	47,520	2.83	35.4	Diam., 1.93=2.93	41.3	.....do.....	.28,	.33,	.80*,	.49,	.31,	.27,	.23,	.22
6042	F	2.53	5.03	129,800	25,800	243,500	48,410	2.32	29.0	Diam., 1.97=3.05	39.4	.....do.....	.20,	.20,	.22,	.25,	.23,	.28,	.33,	.61*
6043	G	2.52	4.99	123,150	24,680	235,400	47,170	1.97	24.6	Diam., 1.93=2.93	41.3	Fibrous, seamy ...	.19,	.19,	.21,	.21,	.25,	.25,	.27,	.40
6044	P	2.66	5.56	134,200	24,140	262,390	47,190	2.90	36.3	Diam., 2.06=3.33	40.1	Fibrous, granular center.	.27,	.24,	.30,	.39,	.66*,	.44,	.32,	.28
6045	Q	2.64	5.47	135,100	24,700	262,700	48,030	2.90	36.3	Diam., 2.02=3.20	41.5	Fibrous, seamy ...	.29,	.33,	.68*,	.51,	.33,	.27,	.26,	.23
6046	R	2.65	5.51	137,600	24,970	265,100	48,110	2.63	32.9	Diam., 2.10=3.46	37.2	Fibrous	.27,	.31,	.44,	.58*,	.31,	.28,	.22,	.22
6047	S	2.65	5.51	135,660	24,620	264,370	47,980	2.43	30.4	Diam., 2.05=3.30	40.1	Fibrous, granular center.	.60*,	.43,	.28,	.19,	.19,	.21,	.24,	.29
6048	T	2.65	5.51	134,500	24,410	263,340	47,790	2.61	32.6	Diam., 2.07=3.37	38.9	.....do.....	.20,	.21,	.29,	.41,	.62*,	.37,	.28,	.23
6049	W	2.77	6.03	155,800	25,840	288,150	47,780	2.98	37.3	Diam., 2.15=3.63	39.8	.....do.....	.27,	.26,	.31,	.45,	.63*,	.39,	.30,	.37
6050	X	2.77	6.03	151,700	25,160	288,510	47,850	2.59	32.4	Diam., 2.14=3.60	40.3	.....do.....	.22,	.25,	.21,	.21,	.22,	.37,	.52*,	.59*
6051	Y	2.78	6.07	155,300	25,580	291,260	47,980	3.00	38.6	Diam., 2.14=3.60	40.7	.....do.....	.27,	.26,	.34,	.41,	.70*,	.44,	.36,	.31
6052	Z	2.77	6.03	151,750	25,170	286,600	47,530	2.58	32.3	Diam., 2.16=3.66	39.3	.....do.....	.20,	.21,	.24,	.25,	.28,	.40,	.62*,	.38
6053	&	2.77	6.03	151,300	25,090	289,100	47,940	2.92	36.5	Diam., 2.16=3.66	39.3	.....do.....	.28,	.30,	.33,	.57*,	.53*,	.38,	.29,	.24

Tensile tests of chain iron—Continued.

No. of test.	Mark on specimen.	Diameter.	Sectional area.	Elastic limit. Total.	Elastic limit. Per square inch.	Ultimate strength. Total.	Ultimate strength. Per square inch.	Elongation in 10 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.	Elongation of inch sections									
		Inches.	*Sq. in.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Inches.*	*Per ct.*	*In. Sq. in.*	*P. ct.*		"	"	"	"	"	"	"	"	"	"
6176	A	2.50	4.91	127,700	26,010	241,850	49,260	2.20	22.0	Diam., 2.00=3.14	36.0	Fibrous	.25,	.23,	.20,	.14,	.18,	.17,	.15,	.20,	.28,	.40*
6177	B	2.52	4.99	118,200	23,690	228,800	45,850	2.80	28.0	Diam., 2.09=3.43	31.3	Fibrous, seamy	.22,	.26,	.31,	.51*,	.39,	.25,	.25,	.20,	.21,	.20
6178	C	2.51	4.95	120,250	24,290	236,210	47,720	2.70	27.0	Diam., 2.04=3.27	33.9	Fibrous	.58*,	.33,	.26,	.22,	.21,	.21,	.24,	.24,	.21,	.20
6179	D	2.50	4.91	124,900	25,440	235,360	47,930	3.10	31.0	Diam., 1.98=3.08	37.2	do	.42,	.66*,	.35,	.28,	.28,	.22,	.21,	.20,	.26,	.22
6180	E	2.51	4.95	128,600	25,980	238,200	48,120	2.55	25.5	Diam., 2.12=3.53	28.7	Fibrous, with granular streaks.	.28,	.24,	.22,	.21,	.19,	.21	.23,	.22,	.30,	.45*
6181	F	2.51	4.95	128,100	25,880	239,900	48,460	3.02	30.2	Diam., 2.02=3.20	35.4	Fibrous	.50*,	.51*,	.35,	.25,	.26,	.23,	.23,	.25,	.22,	.22
6182	G	2.51	4.95	119,900	24,220	238,500	48,180	2.88	28.8	Diam., 1.97=3.05	38.4	do	.60*,	.32,	.27,	.23,	.26,	.22,	.21,	.23,	.25,	.29
6183	I	2.50	4.91	141,000	28,720	256,300	52,200	2.96	29.6	Diam., 2.11=3.50	28.7	do	.22,	.24,	.24,	.28,	.32,	.55*,	.34,	.29,	.23,	.25
6184	III	2.50	4.91	140,800	28,680	256,100	52,160	2.89	28.9	Diam., 2.10=3.46	29.5	do	.21,	.23,	.24,	.22,	.25,	.26,	.32,	.40*,	.37,	.30
6185	VII	2.51	4.95	139,900	28,260	251,700	50,850	3.08	30.8	Diam., 1.97=3.05	38.4	do	.42,	.63*,	.36,	.28,	.27,	.23,	.22,	.23,	.22,	.22
6186	IX	2.52	4.99	132,400	26,530	248,720	49,840	2.90	29.0	Diam., 1.99=3.11	37.7	do	.21,	.22,	.25,	.22,	.23,	.26,	.22,	.29,	.38,	.62*
6187	XIV	2.51	4.95	126,800	25,620	240,080	48,650	2.47	24.7	Diam., 2.11=3.50	29.3	Fibrous, trace of granulation.	.20,	.20,	.21,	.22,	.25,	.22,	.23,	.26,	.29,	.39*
6188	XV	2.51	4.95	128,200	25,900	241,350	48,760	2.48	24.8	Diam., 2.20=3.80	23.3	Fibrous, 80 per cent; granular and spongy center, 20 per cent.	.22,	.26,	.21,	.22,	.27,	.23,	.41*,	.25,	.21,	.20
6189	XVIII	2.52	4.99	129,800	26,010	247,290	49,560	3.21	32.1	Diam., 2.05=3.30	33.9	Fibrous	.31,	.32,	.47,	.58*,	.40,	.24,	.27,	.21,	.22,	.19
6190	XX	2.52	4.99	131,000	26,250	242,500	48,600	3.40	34.0	Diam., 1.97=3.05	38.9	do	.25,	.34,	.56*,	.46,	.34,	.27,	.29,	.29,	.30,	.30
6191	XXIII	2.52	4.99	130,700	26,190	248,150	49,730	2.62	26.2	Diam., 2.09=3.43	31.3	do	.40,	.43*,	.27,	.22,	.26,	.21,	.20,	.22,	.21,	.20
6192	XXV	2.51	4.95	129,100	26,080	247,060	49,910	2.94	29.4	Diam., 2.06=3.33	32.7	do	.33,	.55,	.41,	.28,	.23,	.25,	.24,	.21,	.21,	.23
6193	XXVIII	2.52	4.99	129,500	25,950	245,100	49,120	2.68	26.8	Diam., 1.98=3.08	38.2	do	.60*,	.32,	.26,	.22,	.21,	.21,	.22,	.23,	.21,	.20
6194	XXXI	2.51	4.95	130,200	26,300	242,800	49,050	3.21	32.1	Diam., 2.06=3.33	32.7	do	.29,	.32,	.57*,	.35,	.30,	.29,	.29,	.30,	.27,	.23
6195	XXXIV	2.51	4.95	131,500	26,560	242,190	48,930	2.82	28.2	Diam., 2.15=3.63	26.7	Fibrous, spongy	.21,	.24,	.26,	.31,	.49*,	.30,	.28,	.23,	.27,	.23
								Elongation in 8 inches.														
6201	VIII	2.49	4.87	131,800	27,060	243,080	49,910	2.57	32.1	Diam., 2.08=3.40	30.2	Fibrous, 95 per cent; granular, 5 per cent.	.48*,	.42,	.32,	.28,	.28,	.25,	.27,	.27		
6202	X	2.51	4.95	132,700	26,800	244,100	49,310	2.60	32.5	Diam., 2.05=3.30	33.3	Fibrous, trace of granulation.	.56*,	.45,	.32,	.28,	.27,	.23,	.25,	.24		
6203	X	2.51	4.95	134,100	27,090	247,200	49,940	2.78	34.8	Diam., 2.00=3.14	36.6	Fibrous	.30,	.38,	.62*,	.39,	.30,	.25,	.26,	.28		
6204	XI	2.52	4.99	142,400	28,540	252,800	50,660	2.40	30.0	Diam., 2.12=3.53	29.3	Fibrous, trace of granulation.	.26,	.25,	.29,	.42,	.34,	.27,	.28,	.29		
6205	XII	2.51	4.95	124,900	25,230	245,600	49,620	2.69	33.6	Diam., 2.00=3.14	36.6	Fibrous	.23,	.26,	.24,	.27,	.37,	.58*,	.44,	.30		
6206	XII	2.51	4.95	123,300	24,910	246,740	49,850	2.53	31.6	Diam., 2.03=3.24	34.5	do	.35,	.55*,	.41,	.29,	.23,	.25,	.22,	.23		

PROOF STRESS OF 15,000 POUNDS APPLIED TO $\frac{5}{8}$″ CHAIN FOR 8″ BARBETTE CARRIAGE.

No. 5858.

6,000 pounds applied to section about 12 feet long; increased to 7,000 pounds and an apparent set of ″.23 obtained, due, it was thought, to end fastenings yielding.

100-inch gauge rod now applied to the chain and observations began under load of 6,000 pounds.

Applied loads.	Length of 100-inch section.	Elongation in 100 inches.	Remarks.
Pounds.	*Inches.*	*Inches.*	
6,000	100	0.	
7,000	100.02	.02	
8,000	100.06	.06	
9,000	100.10	.10	
10,000	100.15	.15	
11,000	100.21	.21	
12,000	100.27	.27	
13,000	100.42	.42	
14,000	100.70	.70	
15,000	101.35	1.35	Maximum load.
12,000	101.30	1.30	
6,000	101.14	1.14	

SECOND SECTION TESTED.

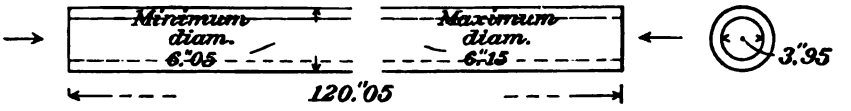
1,000	100.	0.	
2,000	100.11	.11	
3,000	100.15	.15	
4,000	100.20	.20	
5,000	100.26	.26	
6,000	100.31	.31	
7,000	100.38	.38	
8,000	100.42	.42	
9,000	100.44	.44	
10,000	100.49	.49	
11,000	100.52	.52	
12,000	100.60	.60	
13,000	100.71	.71	
14,000	100.92	.92	
15,000	101.48	1.48	Maximum load.
12,000	101.40	1.40	
6,000	101.25	1.25	
1,000	101.05	1.05	

COLUMNS.

CAST IRON AND SPRUCE.

CAST IRON COLUMN.

No. 5938.



Sectional area, 17 square inches.
Weight, 500 pounds.
Gauged length, 100 inches.

Applied loads.		In gauged length.		Deflections at middle.		Remarks.	
Total.	Per square inch.	Compression.	Set.	Horizontal.	Vertical.		
Pounds.	*Pounds.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*		
8,500	500	0.	0.	0.	0.	Initial load.	
17,000	1,000	.0032	.....	0.	0.		
34,000	2,000	.0093	.....	0.	0.		
51,000	3,000	.0157	.....	0.	0.	Deflection sets.	
68,000	4,000	.0225	.....	0.	0.	Horizontal.	Vertical.
85,000	5,000	.0298	.0018	0.	0.	0.	0.
102,000	6,000	.0373	.....	0.	.01		
119,000	7,000	.0455	.....	0.	.02		
136,000	8,000	.0530	.....	0.	.02		
153,000	9,000	.0609	.....	0.	.02		
170,000	10,000	.0688	.0054	0.	.02		
187,000	11,000	.0769	.....	0.	.02		
204,000	12,000	.0853	.....	0.	.02		
221,000	13,000	.0936	.....	0.	.03		
238,000	14,000	.1023	.....	0.	.03		
255,000	15,000	.1110	.0112	0.	.03	0.	".01
272,000	16,000	.1204	.....	0.	.04		
289,000	17,000	.1295	.....	0.	.04		
306,000	18,000	.1390	.....	0.	.05		
323,000	19,000	.1494	.....	0.	.05		
340,000	20,000	.1597	.0235	0.	.06	0.	".02
357,000	21,000	.1713	.....	0.	.07		
374,000	22,000	.1816	.....	0.	.08		
391,000	23,000	.1948	.....	0.	.09		
408,000	24,000	.2080	.....	0.	.10		
425,000	25,000	.2234	.0498	0.	.11	0.	".05
442,000	26,000	.2430	.....	0.	.12		
459,000	27,000	.2592	.0685	0.	.14		
476,000	28,000	.....	.....	0.	.17	0.	".08
493,000	29,000	.....	.....	0.	.22		
510,000	30,000	.....	.....	0.	.24		
527,000	31,000	.....	.....	0.	.29		
544,000	32,000	.....	.....	0.	.40		
561,000	33,000	.....	.....	0.	.66		
566,700	.....	.....	.....	0.	1.03		
566,800	33,340	.....	.....	0.	1.10	Ultimate strength.	
566,700	.....	.....	.....	0.	1.15		
566,600	.....	.....	.....	0.	1.20		
566,400	.....	.....	.....	0.	1.25		
566,100	.....	.....	.....	0.	1.30		
565,700	.....	.....	.....	0.	1.35		
565,200	.....	.....	.....	0.	1.40		
564,600	.....	.....	.....	0.	1.45		
563,900	.....	.....	.....	0.	1.50		
400,000	.....	.....	.....	.....	.....	Rested 1 hour under this load.	
557,700	.....	.....	.....	0.	1.60		
557,200	.....	.....	.....	0.	1.65		

No. 5938—Continued.

Applied loads.		In gauged length.		Deflections at middle.		Remarks.
Total.	Per square inch.	Compression.	Set.	Horizontal.	Vertical.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inches.*	
556,500	.....	.....	.....	0.	1.70	
554,600	.....	.....	.....	0.	1.80	
552,200	.....	.....	.....	0.	1.90	
550,200	.....	.....	.....	0.	2.00	
547,500	.....	.....	.....	0.	2.10	
538,300	.....	.....	.....	0.	2.50	
521,000	.....	.....	.....	0.	3.00	
508,000	.....	.....	.....	0.	3.20	
8,500	.....	.....	.....	0.	2.40	

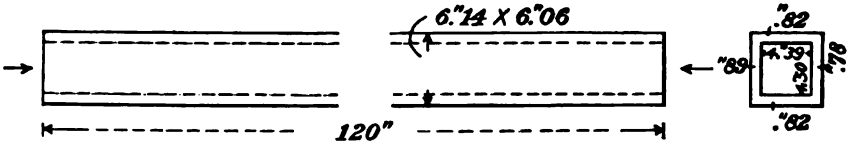
Test discontinued.

Column failed by triple flexure. Spongy metal on the concave side of the bent column in the vicinity of two $\frac{3}{8}$″ pins used for supporting the core of the casting and located 1 foot each side of the middle of the length of the column.

Near one $\frac{3}{8}$″ pin there was a blowhole $\frac{7}{8}$″ diameter, and near the other pin a blowhole $1\frac{3}{4}$″ diameter, located just below the outer surface of the casting. This spongy metal appeared to influence the manner of failure, the metal yielding in this vicinity.

CAST IRON COLUMN.

No. 5939.



Sectional area, 17.45 square inches.
Weight, 517 pounds.
Gauged length, 100″.

Applied loads.		In gauged length.		Deflections at middle.		Remarks.
Total.	Per square inch.	Compression.	Set.	Horizontal.	Vertical.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
8,725	500	0.	0.	0.	0.	Initial load.
17,450	.1,000	.0032	.....	0.	0.	
34,900	2,000	.0094	.....	0.	0.	
52,350	3,000	.0159	.....	0.	0.	Deflection sets.
69,800	4,000	.0228	.....	0.	0.	Horizontal. Vertical.
87,250	5,000	.0301	.0022	0.	0.	0. 0.
104,700	6,000	.0371	.....	0.	0.	
122,150	7,000	.0446	.....	0.	0.	
139,600	8,000	.0521	.....	0.	0.	
157,050	9,000	.0597	.....	0.	0.	
174,500	10,000	.0673	.0057	0.	0.	0. 0.
191,950	11,000	.0751	.....	0.	0.	
209,400	12,000	.0825	.....	0.	0.	

No. 5939—Continued.

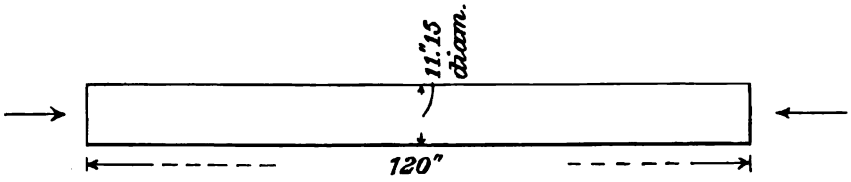
Applied loads.		In gauged length.		Deflections at middle.		Remarks.	
Total.	Per square inch.	Compression.	Set.	Horizontal.	Vertical.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inches.*	*Inch.*		
226, 850	13, 000	.0904	.....	0.	0.		
244, 300	14, 000	.0983	.....	0.	0.		
261, 750	15, 000	.1063	.0107	0.	0.	0.	0.
279, 200	16, 000	.1147	.....	0.	0.		
296, 650	17, 000	.1228	.....	0.	0.		
314, 100	18, 000	.1308	.....	0.	.01		
331, 550	19, 000	.1393	.....	0.	.01		
349, 000	20, 000	.1487	.0181	0.	.02	0.	0.
366, 450	21, 000	.1578	.....	.01	.02		
383, 900	22, 000	.1668	.....	.01	.02		
401, 350	23, 000	.1763	.....	.01	.02		
418, 800	24, 000	.1864	.....	.01	.03		
436, 250	25, 000	.1976	.0312	.01	.03	0.	0.
453, 700	26, 000	.2092	.....	.01	.03		
471, 150	27, 000	.2188	.....	.01	.03		
488, 600	28, 000	.2316	.....	.01	.03		
506, 050	29, 000	.2445	.....	.01	.04		
523, 500	30, 000	.2578	.0563	.01	.04	0.	″.01
540, 950	31, 000	.2749	.....	.01	.05		
558, 400	32, 000	.2911	.....	.01	.06		
575, 850	33, 000	.3088	.0847	.01	.07	0.	″.03
593, 300	34, 000	.....	.....	.01	.10		
610, 750	35, 000	.....	.....	.0	.11		
628, 200	36, 000	.....	.....	—.03	.13		
645, 650	37, 000	.....	.....	—.10	.17		
663, 100	38, 000	.....	.....	—.18	.20		
680, 550	39, 000	.....	.....	—.31	.24		
698, 000	40, 000	.....	.....	—.61	.30		
700, 000	.....	.....	.....	—.71	.30		
701, 000	.....	.....	.....	—.77	.31		
702, 000	.....	.....	.....	—.86	.32		
703, 000	.....	.....	.....	—.92	.32		
704, 000	.....	.....	.....	—1.00	.33		
706, 000	.....	.....	.....	—1.08	.34		
706, 330	40, 480	.....	.....	—1.19	.34	Ultimate strength.	
706, 000	.....	.....	.....	—1.31	.34		
705, 000	.....	.....	.....	—1.48	.36		
704, 000	.....	.....	.....	—1.58	.37		
701, 000	.....	.....	.....	—1.95	.40		
692, 100	.....	.....	.....	—2.50	.44		
670, 000	.....	.....	.....	—3.30	.60		
665, 200	.....	.....	.....	—3.43	.61		

Column failed by triple flexure.

When the middle deflection reached 3″.43 the metal on the convex side fractured by tension; the test was then discontinued.

SPRUCE POST.

No. 6013.



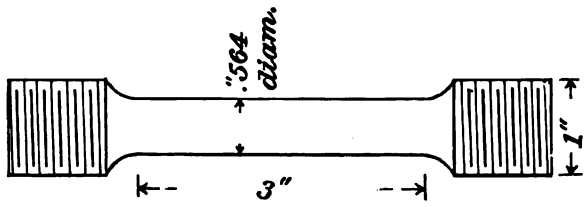
Weight, 204 pounds.
Specific gravity, .4814.
Average number of rings per inch, 15.
Sectional area, 97.6 square inches.
Season cracks extend from end to end of post.
Gauged length, 50".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,760	100	0.	0.	Initial load.
19,520	200	.0035	.....	
29,280	300	.0072	.....	
39,040	400	.0108	.....	
48,800	500	.0144	0.	
58,560	600	.0179	.....	
68,320	700	.0215	.....	
78,080	800	.0251	.....	
87,840	900	.0287	.....	
97,600	1,000	.0324	0.	
117,120	1,200	.0401	.....	
136,640	1,400	.0474	.....	
156,160	1,600	.0549	.....	
175,680	1,800	.0629	.....	Snapping sounds.
195,200	2,000	.0718	.0007	
214,720	2,200	.0850	.....	
234,240	2,400	.....	.....	Ultimate strength.

Failed by crushing fibers at a group of knots 3 feet from end of post. The knots in this vicinity were $\frac{1}{2}$" diameter. Slight crushing of fibers.

TENSILE TESTS OF WROUGHT-IRON BOLTS FOR THE ENGINEER CORPS, U. S. A.

The bodies of the $1\frac{1}{4}''$ bolts tested in full section, the $1''$ bolt turned down into form of specimen here shown.



No. of test.	Description.	Diameter.	Sectional area.	Elastic limit.		Tensile strength.		Elongation in 5 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.	Elongation of inch sections.
				Total.	Per square inch.	Total.	Per square inch.	Inches.	Per cent.				
		Inches.	*Sq. ins.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*			*" Sq. in.*	*Per ct.*		*" " " "

BRICK PIERS.

BRICK PIERS.

These piers, which formed a part of the testing department exhibit at the World's Columbian Exposition, were built to illustrate certain features in brick-pier construction.

They were built of face bricks throughout, equal care being used in laying the cores of the solid piers and the outside courses, the workmanship being superior in each case.

The influence of the quality of the mortar on the ultimate crushing resistance of the brickwork is well shown. The 16-inch pier laid in lime mortar failed at 335,900 pounds, whereas the corresponding pier laid in Neat Portland cement sustained 791,200 pounds—over two and one-third times the strength of the former.

The pier laid in Neat Portland cement was the more rigid, as shown by the following comparisons, the compressions and permanent sets being taken on a gauged length of 50″.

Applied loads.	Pier laid in—				Remarks.
	Lime mortar.		Neat Portland cement.		
	Compression.	Permanent set.	Compression.	Permanent set.	
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
10,000	.....	.....	.....	.....	Initial load.
100,000	.0440	.0207	.0137	.0013	
200,000	.1170	.0638	.0318	.0040	
300,000	.2199	.....	.0495	.0069	
600,000	.....	.....	.1089	.0189	
700,000	.....	.....	.1318	.0250	
750,000	.....	.....	.1457	.....	

A 12″ hollow pier was laid up in Neat Portland cement, which gave an ultimate resistance of 3,214 pounds per square inch, closely agreeing in strength per square inch with the 16″ pier laid in the same kind of mortar.

Another hollow pier was constructed in which the bricks were laid on edge. The outside dimensions were 10″.2 by 10″.15, and the ultimate resistance of this pier was 4,623 pounds per square inch, the total number of pounds being 323,100—figures strikingly near the total number of pounds sustained by the 16″ pier which was laid in lime mortar.

Pier No. 6007, laid in lime mortar, had a base 16″ by 16″ eleven courses high, which was drawn in on two sides to a top section 8″ by 16″.

During the test the larger section of the base fractured; no cracks developed in the top section. The weakness of the base of this pier and the great strength of the 10″ pier having bricks laid on edge are attributed to the variation in transverse strength of the bricks according to the manner of laying and to the influence of the quality of the mortar employed in the two instances.

Pier No. 6008, laid in Neat Portland cement, which had a base 16″ by 16″ and was drawn in to an 8″ pier at the top, failed in the top section.

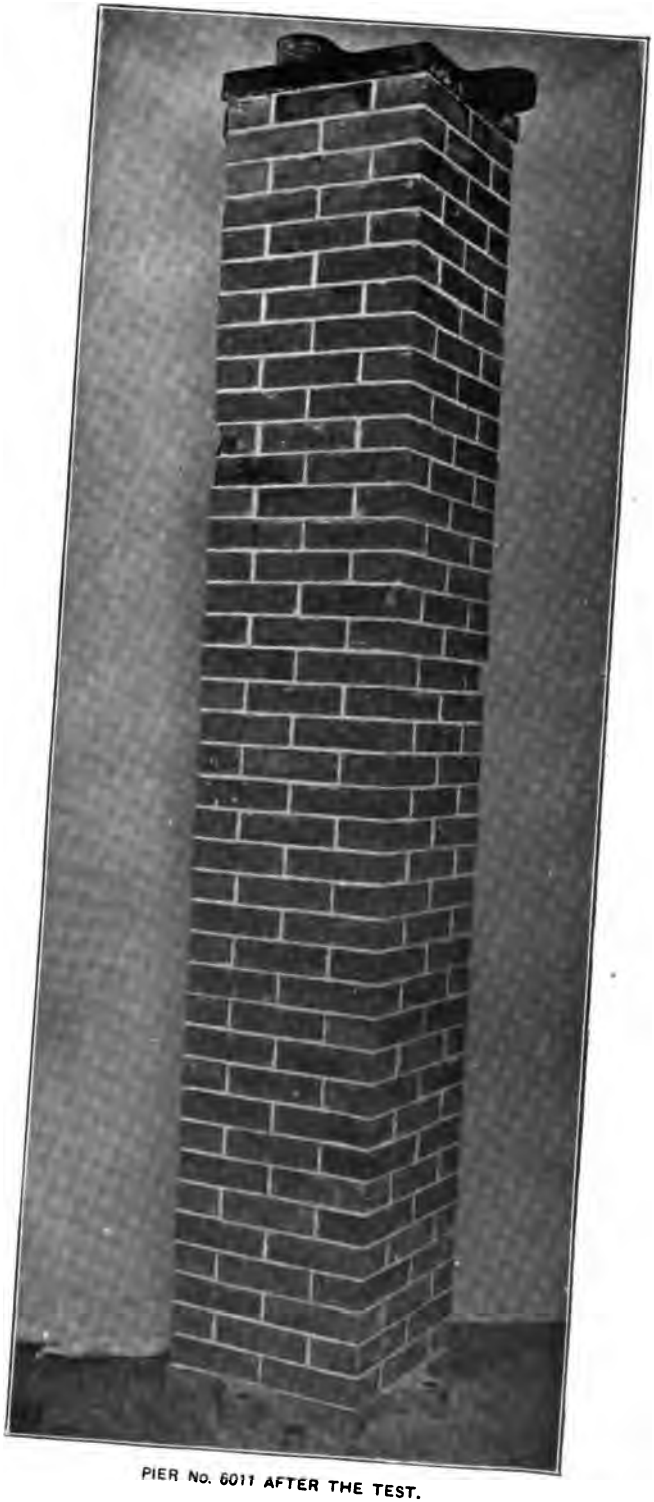
In this pier a greater difference in sectional area existed between the top and the base, and the latter was not injured by the test.

No. 6011.

16″ FACE BRICK PIER.

Built of 40 courses of face brick laid in lime mortar.
Solid core of face brick laid in lime mortar.
Age when tested, 2½ months.
Total weight, 1,777 pounds.
Weight per cubic foot, 126.8 pounds.
Total height, 96″.37.
Sectional area, 15″.90 by 15″.80=251.2 square inches.
Average thickness of joints, $\frac{3}{16}$″.
Gauged length, 50″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,000	.....	0.	0.	Initial load.
12,000	.....	.0002	.....	
14,000	.....	.0004	.....	
16,000	.....	.0007	.....	
18,000	.....	.0010	.....	
20,000	.....	.0014	.0001	
22,000	.....	.0020	.....	
24,000	.....	.0025	.....	
26,000	.....	.0032	.....	
28,000	.....	.0039	.....	
30,000	.....	.0046	.0013	
32,000	.....	.0056	.....	
34,000	.....	.0066	.....	
36,000	.....	.0073	.....	
38,000	.....	.0080	.....	
40,000	.....	.0089	.0032	
40,000	.....	.0094	.....	Second application of load.
42,000	.....	.0101	.....	
44,000	.....	.0108	.....	
46,000	.....	.0121	.....	
48,000	.....	.0130	.....	
50,000	.....	.0138	.0054	
50,000	.....	.0146	.....	Do.
52,000	.....	.0168	.....	
54,000	.....	.0175	.....	
56,000	.....	.0180	.....	
58,000	.....	.0185	.....	
60,000	.....	.0194	.0084	
65,000	.....	.0220	.....	
70,000	.....	.0244	.....	
75,000	.....	.0278	.....	
80,000	.....	.0306	.0135	
85,000	.....	.0350	.....	
90,000	.....	.0379	.....	
95,000	.....	.0409	.....	
100,000	.....	.0440	.0207	
105,000	.....	.0488	.....	
110,000	.....	.0511	.....	
115,000	.....	.0539	.....	
120,000	.....	.0575	.0281	
120,000	.....	.0609	.....	Do.
125,000	.....	.0633	.....	
130,000	.....	.0659	.....	
135,000	.....	.0685	.....	
140,000	.....	.0726	.0365	
140,000	.....	.3760	.....	Do.
150,000	.....	.0814	.....	
160,000	.....	.0890	.....	Cracks in the fourteenth and twenty-second course from bottom.
170,000	.....	.0945	.....	
180,000	.....	.1055	.....	
190,000	.....	.1102	.....	
200,000	.....	.1170	.....	
180,000	.....	.1151	.....	
160,000	.....	.1122	.....	
140,000	.....	.1088	.....	



PIER No. 6011 AFTER THE TEST.

No. 6011—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
120,000	.....	.1051	.....	
100,000	.....	.1010	.....	
80,000	.....	.0961	.....	
60,000	.....	.0903	.....	
40,000	.....	.0828	.....	
20,000	.....	.0720	.0638	
20,000	.....	.0684	.....	
40,000	.....	.0776	.....	
60,000	.....	.0851	.....	
80,000	.....	.0914	.....	
100,000	.....	.0970	.....	
120,000	.....	.1020	.....	
140,000	.....	.1066	.....	
160,000	.....	.1113	.....	
180,000	.....	.1195	.....	
200,000	.....	.1270	.....	
210,000	.....	.1304	.....	
220,000	.....	.1339	.....	
230,000	.....	.1406	.....	
240,000	.....	.1488	.....	
250,000	.....	.1583	.....	
260,000	.....	.1694	.....	
270,000	.....	.1755	.....	
280,000	.....	.1855	.....	
290,000	.....	.1969	.....	
300,000	.....	.2079	.....	
310,000	.....	.2199	.....	
335,900	1,337	.....	.....	Ultimate strength.

Pier failed by the development of longitudinal cracks and the partial crushing of individual bricks.

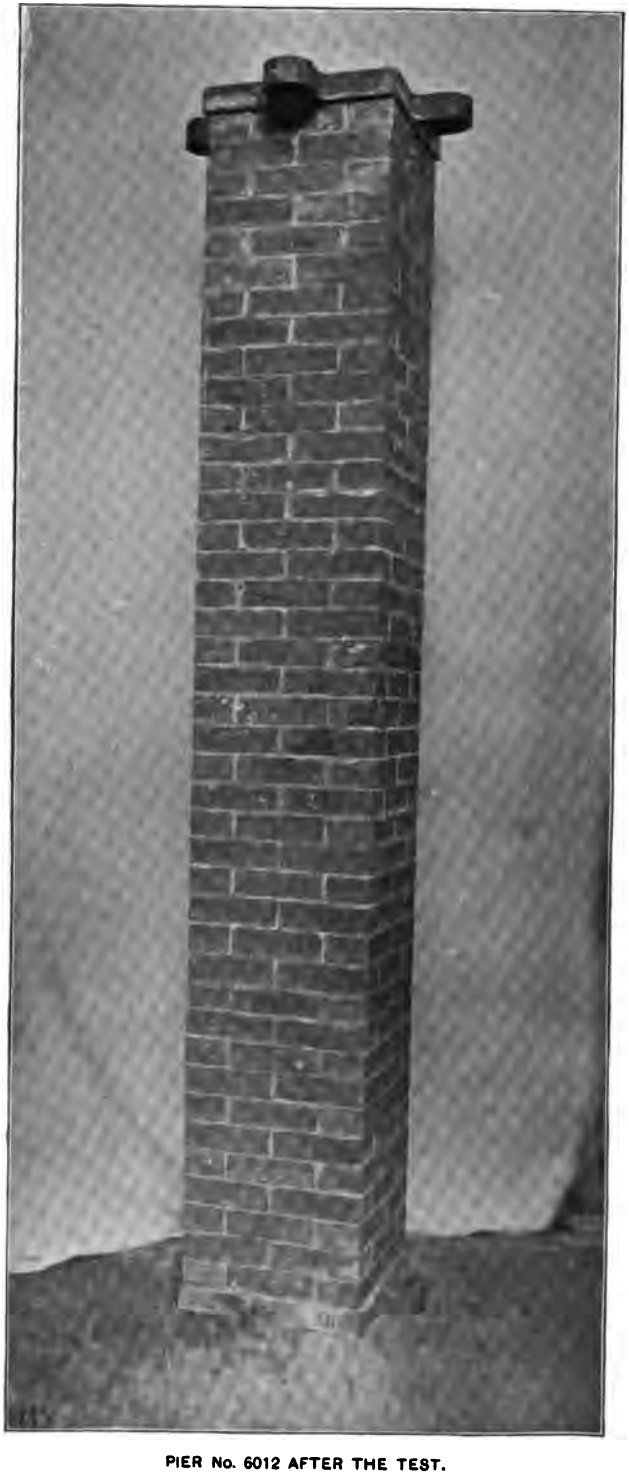
After cracks first began to appear they developed with increasing frequency as the maximum load was approached. When the maximum load was reached the majority of the bricks were fractured.

No. 6012.

16″ FACE BRICK PIER.

Built of 40 courses of face brick, laid in Neat Portland cement.
Solid core of face brick, laid in Neat Portland cement.
Age when tested, 2½ months.
Total weight, 1,863 pounds.
Weight per cubic foot, 135.6 pounds.
Total height, 96″.29.
Sectional area, 15″.7 by 15″.7 = 246.5 square inches.
Average thickness of joints, $\frac{3}{16}$″.
Gauged length, 50″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,000	.....	0.	0.	Initial load.
20,000	.....	.0006	.....	
30,000	.....	.0018	.....	
40,000	.....	.0032	.....	
50,000	.....	.0049	.0002	
60,000	.....	.0066	.....	
70,000	.....	.0083	.....	
80,000	.....	.0102	.....	
90,000	.....	.0119	.....	
100,000	.....	.0137	.0013	
110,000	.....	.0155	.....	
120,000	.....	.0171	.....	
130,000	.....	.0192	.....	
140,000	.....	.0206	.....	
150,000	.....	.0223	.....	
160,000	.....	.0241	.....	
170,000	.....	.0263	.....	
180,000	.....	.0279	.....	
190,000	.....	.0295	.....	
200,000	.....	.0318	.0040	
200,000	.....	.0325	.....	Second application of load.
210,000	.....	.0342	.....	
220,000	.....	.0357	.....	
230,000	.....	.0371	.....	
240,000	.....	.0389	.....	
250,000	.....	.0404	.....	
260,000	.....	.0421	.....	
270,000	.....	.0439	.....	
280,000	.....	.0457	.....	
290,000	.....	.0474	.....	
300,000	.....	.0495	.....	
250,000	.....	.0444	.....	
200,000	.....	.0382	.....	
150,000	.....	.0317	.....	
100,000	.....	.0245	.....	
50,000	.....	.0157	.0069	
50,000	.....	.0142	.....	Do.
100,000	.....	.0229	.....	
150,000	.....	.0302	.....	
200,000	.....	.0371	.....	
250,000	.....	.0435	.....	
300,000	.....	.0506	.....	
310,000	.....	.0537	.....	
320,000	.....	.0548	.....	
330,000	.....	.0563	.....	
340,000	.....	.0577	.....	
350,000	.....	.0596	.....	
360,000	.....	.0612	.....	
370,000	.....	.0630	.....	
380,000	.....	.0647	.....	
390,000	.....	.0669	.....	
400,000	.....	.0686	.0107	
400,000	.....	.0701	.....	Do.
410,000	.....	.0719	.....	
420,000	.....	.0736	.....	
430,000	.....	.0755	.....	
440,000	.....	.0771	.....	



PIER No. 6012 AFTER THE TEST.

No 6012—Continued.

Applied loads.		In guaged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
450, 000	.....	.0789	.....	Brick in tenth course from bottom slightly flaking.
460, 000	.....	.0813	.....	
470, 000	.....	.0830	.....	
480, 000	.....	.0850	.....	
490, 000	.....	.0865	.....	
500, 000	.....	.0880	.0148	
500, 000	.....	.0904	.....	Second application of load.
510, 000	.....	.0924	.....	
520, 000	.....	.0940	.....	
530, 000	.....	.0961	.....	
540. 000	.....	.0978	.....	
550, 000	.....	.0994	.....	
560, 000	.....	.1011	.....	Brick in fortieth course flaking slightly.
570, 000	.....	.1030	.....	
580, 000	.....	.1049	.....	
590, 000	.....	.1066	.....	
600, 000	.....	.1089	.0189	
600, 000	.....	.1118	.....	Second application of load.
610, 000	.....	.1135	.....	
620, 000	.....	.1154	.....	
630, 000	.....	.1172	.....	
640. 000	.....	.1190	.....	
650, 000	.....	.1209	.....	
660. 000	.....	.1229	.....	
670, 000	.....	.1248	.....	
680, 000	.....	.1274	.....	
690, 000	.....	.1295	.....	Brick cracked in twenty-second and twenty-third courses.
700, 000	.....	.1318	.0250	
700, 000	.....	.1369	.....	Second application of load.
710, 000	.....	.1392	.....	
720, 000	.....	.1413	.....	
750, 000	.....	.1457	.....	
791, 200	3, 209	.....	.....	Ultimate strength.

Developed longitudinal cracks and partial crushing of bricks. The chief injury occurred near the middle of the height of the pier.

No. 6010.

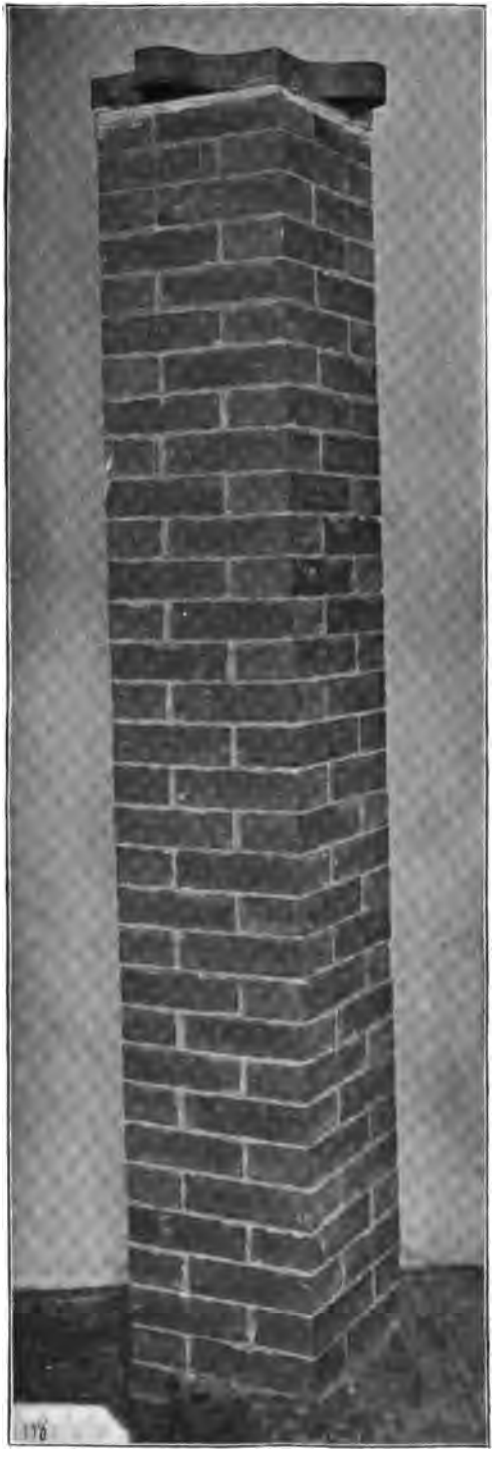
12″ Face Brick Pier, Hollow Core.

Built of 31 courses of face brick laid in Neat Portland cement.
Age when tested, 2½ months.
Total weight, 665 pounds.
Weight per cubic foot, 131.8 pounds.
Total height, 73″.26.

	Square inches.
Outside dimensions, 11″.68 by 11″.68	136.42
Core, 4″.18 by 4″.18	17.47
Sectional area	118.95

Average thickness of joints, $\frac{3}{16}$″.
Gauged length, 50″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
5,000	.....	0.	0.	
6,000	.....	.0002	.....	
7,000	.....	.0004	.....	
8,000	.....	.0006	.....	
9,000	.....	.0009	.....	
10,000	.....	.0013	.0001	
12,000	.....	.0020	.....	
14,000	.....	.0029	.....	
16,000	.....	.0037	.....	
18,000	.....	.0047	.....	
20,000	.....	.0057	.0005	
22,000	.....	.0065	.....	
24,000	.....	.0074	.....	
26,000	.....	.0082	.....	
28,000	.....	.0091	.....	
30,000	.....	.0101	.0014	
34,000	.....	.0122	.....	
38,000	.....	.0141	.....	
42,000	.....	.0162	.....	
46,000	.....	.0179	.....	
50,000	.....	.0199	.0038	
54,000	.....	.0219	.....	
58,000	.....	.0236	.....	
62,000	.....	.0253	.....	
66,000	.....	.0270	.....	
70,000	.....	.0286	.0056	
74,000	.....	.0310	.....	
78,000	.....	.0324	.....	
82,000	.....	.0339	.....	
86,000	.....	.0358	.....	
90,000	.....	.0375	.0077	
94,000	.....	.0398	.....	
98,000	.....	.0413	.....	
100,000	.....	.0420	.0088	
110,000	.....	.0458	.....	
120,000	.....	.0498	.....	
130,000	.....	.0533	.....	
140,000	.....	.0575	.....	
150,000	.....	.0611	.0122	
160,000	.....	.0669	.....	
170,000	.....	.0701	.....	
180,000	.....	.0740	.....	
190,000	.....	.0775	.....	
200,000	.....	.0820	.....	
150,000	.....	.0710	.....	
100,000	.....	.0576	.....	
50,000	.....	.0419	.0173	
50,000	.....	.0390	.....	
100,000	.....	.0555	.....	
150,000	.....	.0695	.....	



PIER No. 6010 AFTER THE TEST.

No. 6010—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
200,000	.....	.0836	.....	
210,000	.....	.0874	.....	
220,000	.....	.0905	.....	
230,000	.....	.0940	.....	
240,000	.....	.0976	.....	Brick in tenth course from top of pier flakes at edge.
250,000	.....	.1021	.0218	
260,000	.....	.1097	.....	
270,000	.....	.1128	.....	
280,000	.....	.1160	.....	
290,000	.....	.1195	.....	
300,000	.....	.1251	.....	
250,000	.....	.1147	.....	
200,000	.....	.1030	.....	
150,000	.....	.0896	.....	
100,000	.....	.0748	.....	
50,000	.....	.0568	.0283	
50,000	.....	.0528	.....	
100,000	.....	.0705	.....	
150,000	.....	.0858	.....	
200,000	.....	.1000	.....	
250,000	.....	.1134	.....	
300,000	.....	.1278	.....	Five bricks cracked; three near the middle of height of pier, two cracks in fifth and seventh courses from the top, respectively.
310,000	.....	.1400	.....	
320,000	.....	.1429	.....	
330,000	.....	.1459	.....	
340,000	.....	.1495	.....	
350,000	.....	.1531	.....	
360,000	.....	.1584	.....	
370,000	.....	.1641	.....	
380,000	.....	.1720	.....	
382,400	3,214	.....	.....	Ultimate strength.

Cracks developed rapidly near the close of the test. The test was discontinued immediately after passing the maximum load. Cracks were formed and sides of bricks flaked off in fifty places, generally distributed over the pier.

No. 6009.

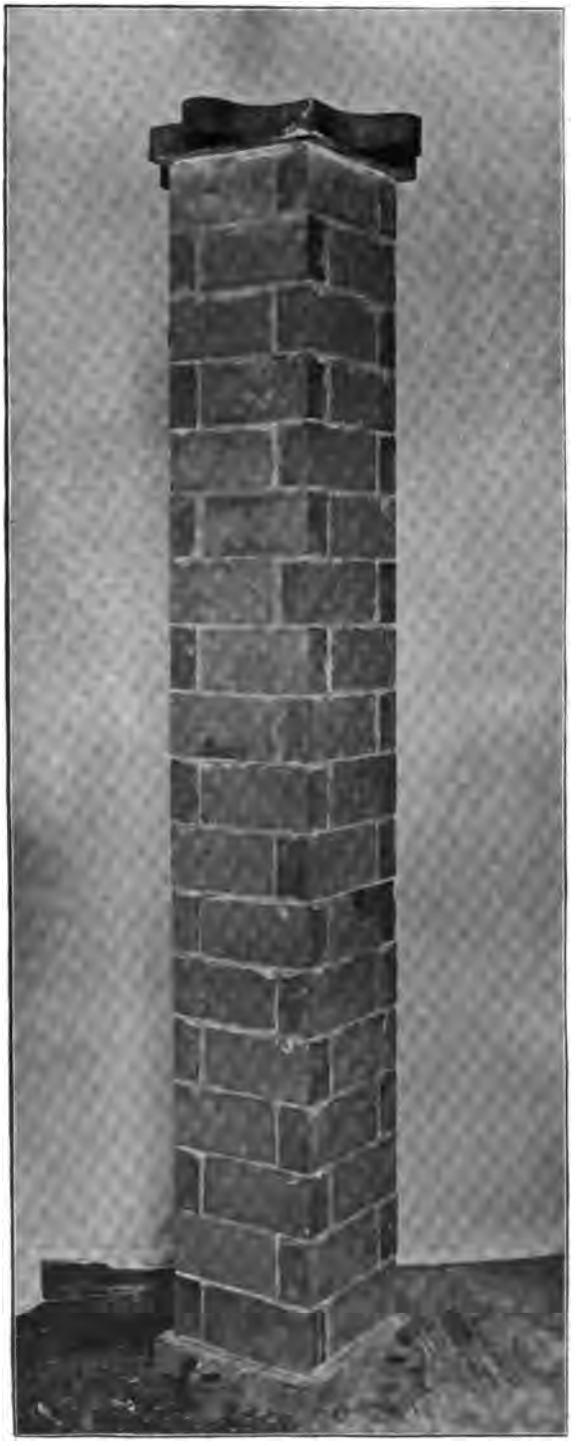
10″ FACE BRICK PIER, HOLLOW CORE (bricks laid on edge).

Built of 18 courses of face brick, laid in Neat Portland cement.
Age when tested, 2½ months.
Total weight, 379 pounds.
Weight per cubic foot, 132.1 pounds.
Total height, 70″.92.

	Square inches.
Outside dimensions, 10″.2 by 10″.15	103.53
Core, 5″.8 by 5″.8	33.64
Sectional area	69.89

Average thickness of joints, $\frac{3}{16}$″.
Gauged length, 50″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
5,000	.....	0.	0.	Initial load.
6,000	.....	.0004	.....	
7,000	.....	.0006	.....	
8,000	.....	.0010	.....	
9,000	.....	.0014	.....	
10,000	.....	.0018	.0001	
11,000	.....	.0022	.....	
12,000	.....	.0025	.....	
13,000	.....	.0028	.....	
14,000	.....	.0033	.....	
15,000	.....	.0037	.0003	
15,000	.....	.0039	.....	Second application of load.
16,000	.....	.0044	.....	
17,000	.....	.0048	.....	
18,000	.....	.0055	.....	
19,000	.....	.0060	.....	
20,000	.....	.0064	.0007	
21,000	.....	.0073	.....	
22,000	.....	.0076	.....	
23,000	.....	.0082	.....	
24,000	.....	.0087	.....	
25,000	.....	.0094	.0018	
25,000	.....	.0095	.....	Do.
26,000	.....	.0100	.....	
27,000	.....	.0105	.....	
28,000	.....	.0109	.....	
29,000	.....	.0114	.....	
30,000	.....	.0119	.0024	
30,000	.....	.0122	.....	Do.
32,000	.....	.0131	.....	
34,000	.....	.0141	.....	
36,000	.....	.0151	.....	
38,000	.....	.0161	.....	
40,000	.....	.0171	.0034	
40,000	.....	.0174	.....	Do.
42,000	.....	.0182	.....	
44,000	.....	.0191	.....	
46,000	.....	.0202	.....	
48,000	.....	.0213	.....	
50,000	.....	.0219	.0044	
50,000	.....	.0226	.....	Do.
52,000	.....	.0234	.....	
54,000	.....	.0242	.....	
56,000	.....	.0249	.....	
58,000	.....	.0257	.....	
60,000	.....	.0267	.0051	
60,000	.....	.0270	.....	Do.
62,000	.....	.0280	.....	
64,000	.....	.0288	.....	
66,000	.....	.0294	.....	
68,000	.....	.0302	.....	
70,000	.....	.0314	.0059	
70,000	.....	.0316	.....	Do.
72,000	.....	.0324	.....	
74,000	.....	.0333	.....	



PIER No. 6006 AFTER THE TEST.

No. 6009—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
76,000		.0341		Second application of load.
78,000		.0350		
80,000		.0358	.0068	
82,000		.0369		
84,000		.0376		
86,000		.0385		
88,000		.0393		
90,000		.0403	.0075	
92,000		.0413		
94,000		.0422		
96,000		.0430		
98,000		.0436		
100,000		.0446	.0082	
102,000		.0461		
104,000		.0466		
106,000		.0475		
108,000		.0484		
110,000		.0491	.0090	
110,000		.0494		Do.
112,000		.0504		
114,000		.0511		
116,000		.0519		
118,000		.0524		
120,000		.0534	.0098	
122,000		.0548		
124,000		.0556		
126,000		.0565		
128,000		.0570		
130,000		.0576	.0104	
130,000		.0582		Do.
134,000		.0595		
138,000		.0611		
142,000		.0625		
146,000		.0644		
150,000		.0660	.0118	
150,000		.0662		Do.
154,000		.0680		
158,000		.0694		
162,000		.0731		
166,000		.0742		
170,000		.0758	.0144	
174,000		.0778		
178,000		.0792		
182,000		.0805		
186,000		.0821		
190,000		.0835	.0152	
190,000		.0845		Do.
194,000		.0865		
198,000		.0879		
200,000		.0888	.0164	
200,000		.0893		Do.
204,000		.0905		
208,000		.0922		
212,000		.0937		
216,000		.0954		
220,000		.0970		
224,000		.0988		
228,000		.1004		
232,000		.1020		
236,000		.1040		
240,000		.1059	.0200	Micrometer removed.
323,100	4,623			Ultimate strength.

Under 256,000 pounds compression, one brick near the middle of the height of the pier flaked off at the edges. As the maximum load was approached longitudinal cracks opened near the middle of the height of the pier and a second brick flaked off at the edges and side.

At the time of reaching the maximum load there was a sudden development of cracks, whereupon the load was immediately released and test discontinued.

Longitudinal cracks were found in nine bricks, all near the middle of the pier. It was a peculiarity of these cracks that all did not follow in continuation of the end joints of adjacent courses of the bricks.

No. 6007.

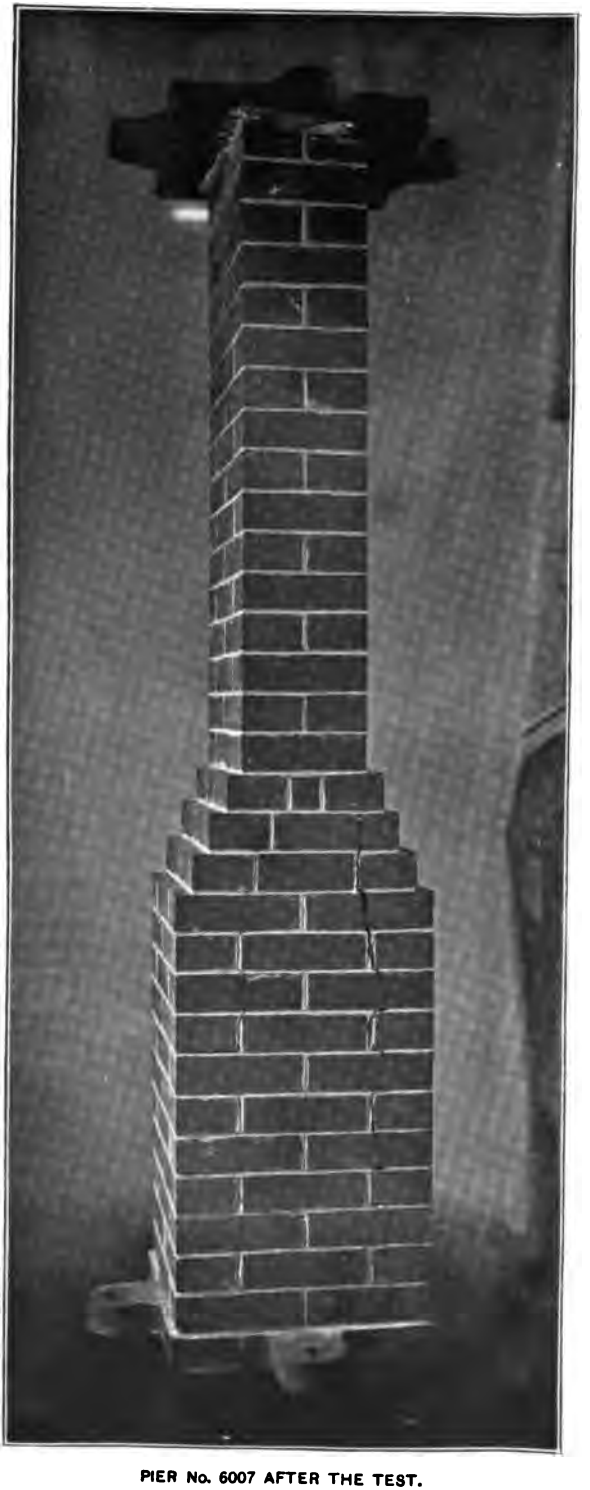
8″ by 16″ Face Brick Pier with 16″ Base.

Built of 30 courses of face brick, laid in lime mortar.
Age when tested, 2½ months.
Total weight of pier, 938 pounds.
Weight per cubic foot, 126.8 pounds.
Total height, 72″.26.

Square inches.

Sectional area, upper section, 15″.8 by 7″.8 ..... 123.24
Sectional area, base, 15″.9 by 15″.9 ..... 252.81
Average thickness of joints, $\frac{3}{16}$″.
Gauged length, 50″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
6,000	.....	0.	0.	Initial load.
8,000	.....	.0003	.....	
10,000	.....	.0010	.....	
12,000	.....	.0017	.....	
14,000	.....	.0025	.....	
16,000	.....	.0034	.....	
18,000	.....	.0042	.....	
20,000	.....	.0055	.0011	
22,000	.....	.0072	.....	
24,000	.....	.0085	.....	
26,000	.....	.0100	.....	
28,000	.....	.0116	.....	
30,000	.....	.0135	.....	
32,000	.....	.0152	.....	
34,000	.....	.0174	.....	
36,000	.....	.0189	.....	
38,000	.....	.0212	.....	
40,000	.....	.0229	.0098	
44,000	.....	.0276	.....	
48,000	.....	.0313	.....	
52,000	.....	.0352	.....	
56,000	.....	.0410	.....	
60,000	.....	.0450	.0226	
64,000	.....	.0520	.....	
68,000	.....	.0571	.....	
72,000	.....	.0597	.....	
76,000	.....	.0639	.....	
80,000	.....	.0689	.0364	
80,000	.....	.0724	.....	Second application of load.
84,000	.....	.0760	.....	
88,000	.....	.0795	.....	
92,000	.....	.0844	.....	
96,000	.....	.0886	.....	
100,000	.....	.0936	.0515	
100,000	.....	.0985	.....	Do.
104,000	.....	.1021	.....	
108,000	.....	.1061	.....	
112,000	.....	.1098	.....	
116,000	.....	.1140	.....	
120,000	.....	.1204	.0686	Brick cracked in next to top course.
124,000	.....	.1260	.....	
128,000	.....	.1330	.....	
132,000	.....	.1410	.....	
136,000	.....	.1490	.....	Cracks a, b, c, and d in sight on one face. An oblique seam developed in other side of pier, as shown on sketch.
140,000	.....	.1579	.....	
144,000	.....	.1703	.....	
148,000	.....	.1781	.....	Cracks extend entire length of base section.
152,000	.....	.....	.....	Ultimate strength.
	1,233	.....	.....	On upper section.
	601	.....	.....	On base.



PIER No. 6007 AFTER THE TEST.

No. 6008 AFTER THE TEST, SHOWING PLATES AND SIDE RODS USED IN HANDLING.

Pier failed by development of cracks in base section.

The general direction of the cracks was longitudinal to the pier, beginning in the contracting section between the base and top sections and extending somewhat obliquely outward near the base.

The cracks were approximately in two planes forming the prolongation of the two opposite broad faces of the top section, and cracks were visible only on the two sides of the pier cut by these planes.

With the exception of the crack which opened slightly in a brick in next to the top course at 120,000 pounds' compression, and flaking off at A A at the lower course of the top section, the failure of the pier was confined to the base and contracting sections.

No. 6008.

8″ Face Brick Pier with 16″ Base.

Built of 31 courses of face brick, laid in Neat Portland cement.
Age when tested, 2½ months.
Total weight of pier, 648 pounds.
Weight per cubic foot, 129.7 pounds.
Total height, 73″.85.

	Square inches.
Sectional area, upper section, 7″.70 by 7″.70	59.29
Sectional area, base, 15″.91 by 15″.82	251.69

Average thickness of joints, $\frac{3}{16}$″.

Under 150,000 pounds' compression cracks were opened in the second and fourth courses above the junction of the contracting section and the top section of the pier.

Ultimate strength, 209,900 pounds, { 3,540 pounds per square inch on upper section. / 833 pounds per square inch on base.

Cracks dividing the top section of the pier into a clustered column of half bricks were generally formed.

After reaching the maximum load, the stress was released to 100,000 pounds' compression. Loads were again gradually applied, and when the stress reached 180,000 pounds' compression the top section yielded explosively, fragments flying from the pier.

The load was immediately reduced and test discontinued.

There were no cracks developed in the contracting and base sections.

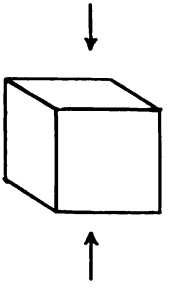
TABULATION OF CRUSHING STRENGTH OF BRICK PIERS BUILT OF FACE BRICKS.

No. of test.	Mortar.	Height.	Cross-section dimensions.	Sectional area.	Weight per cubic foot.	Ultimate strength.			Remarks.
						Total.	Per square inch.	Per square foot.	
		Inches.	*Inches.*	*Sq. in.*	*Pounds.*	*Pounds.*	*Pounds.*	*Tons.*	
6011	Lime mortar	96.37	15.90×15.80	251.2	126.8	335,900	1,337	96.3	
6012	Neat Portland cement	96.29	15.7 ×15.7	246.5	135.6	791,200	3,209	231	
6010	....do	73.26	Outside 11.68×11.68 Hollow core 4.18× 4.18	118.95	131.8	382,400	3,214	231.4	
6009	....do	70.92	Outside 10.2 ×10.15 Hollow core 5.8 × 5.8	69.89	132.1	323,100	4,623	332.8	Bricks laid on edge.
6007	Lime mortar	72.26	Top 15.8 × 7.8 Base 15.9 ×15.9	123.24 252.81	126.8	152,000	1,233 601	88.8 43.3	
6008	Neat Portland cement	73.85	Top 7.70× 7.70 Base 15.91×15.82	59.29 251.69	129.7	209,900	3,540 833	254.9 60	

Piers 2¼ months old when tested.

COMPRESSION OF SANDSTONE FOR THE ENGINEER CORPS, U. S. A.

STONE TO BE USED AT LOCK NO. 2, GREEN RIVER.



Stone tested on bed.

No. of test.	Marks.	Dimensions.			Sectional area.	First crack.	Ultimate strength.	
		Height.	Compressed surface.				Total.	Per square inch.
		Inches.	*Inches.*	*Inches.*	*Sq. in.*	*Pounds.*	*Pounds.*	*Pounds.*
6014	No. 1, Upper Green River	2.76	2.80	2.80	7.84	59,200	59,200	7,551
6015	No. 2, South Carrollton (light)	2.75	2.80	2.78	7.78	50,920	50,920	6,545
6016	No. 3, South Carrollton (reddish)	2.78	2.81	2.75	7.73	46,110	46,110	5,965
6017	No. 4, Eigenmann & Hollerbach	2.80	2.79	2.79	7.78	60,320	60,320	7,753
6018	No. 5	2.75	2.78	2.80	7.78	57,990	57,990	7,453

Pyramidal fractures.

LEATHER, RUBBER, AND COTTON BELTING.

BELTING TESTS.

The series comprises tests of single and double leather belting in widths from 2″ to 30″, 4 and 6 ply rubber belting in the same widths as the leather, and 3 and 4 ply cotton belting from 2″ to 12″ wide.

The leather belting was from selected stock, and represents a superior quality of material. All of this class was oak tanned, excepting specimen No. 6214, which was a semi rawhide stock.

Each of the single-thickness leather belts had a cemented scarf joint; the double belts had a scarf joint in each part.

Tests made with the solid leather without joints are so described in the details and indicated by a footnote in the tabulated results.

The rubber belting was made from 32-ounce duck.

The cotton belting was of a woven description, the warp having 9 picks per inch, the filling 10½ picks. The warp consisted of 3 threads each and the filling 12 threads each, of a finer thread than the warp.

Specimen No. 6213 was made of duck folded in width and the several plies stitched together longitudinally.

During the tests the specimens were secured in the testing machine by being clamped between flat-faced dies covering the width of the specimen, and from 5″ to 10″ in length.

The details of the tests include measurements showing the elongation of the belting under different loads, the permanent sets when the loads were released, and the recovery in length as successive decrements of load were removed.

The recovery in length was more or less sluggish, and the influence of time was noted in a number of cases. The total length of the specimen under a given load was shown to depend in a measure upon the preceding treatment, whether the loads immediately preceding were greater or less than the given load.

This result followed from a retarded recovery under diminishing loads in the early part of the release; proportionally a more rapid recovery accompanied the release of lower loads.

The influence which these characteristics have on the behavior of belts under different tensions and speeds will be recognized.

After completing the tests of the plain specimens, the fractured ends were laced or joined together after different styles and proportions of lacing, or with hooks, studs, or plates, and their strength ascertained.

In a few instances only did the laced specimens reach the strength of the cemented joints. Generally, it may be remarked, to attain the maximum strength in a laced joint, a larger number of lacings are required than are commonly used, and when this number of lacings are used the loads on the individual parts have become so reduced that single lacing is sufficiently strong and a gain in flexibility is secured over the use of double lacings.

The results both with lacings and with hooks indicate that it is necessary to subdivide the pull on the joint in order to effect, so far as possible, a uniform distribution of the load over the full width of the belting, and this is accomplished by using a large number of lacings or hooks. Thus it was shown that increasing the number of lacings on a 12-inch single leather belt from 11 to 37 was accompanied by a gradual increase in the strength of the joint, which began with 3,180 pounds and finally reached 6,054 pounds tensile strength.

No. 5969.

2″ Single Leather Belting.

Actual dimensions:
Length, 60″.
Width, 1″.98.
Thickness, ″.20.
Sectional area, 1″.98 by ″.20 = .396 square inches.
Total weight, 13¾ ounces.
Weight per linear foot, 2¾ ounces.
Length between jaws of machine, 38″.
Gauged length, 30″.

[This specimen contains a scarf cemented joint 4½″ long near the middle of its length, and included within the gauged length.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
0	.....	0.	0.	
50	.....	.45	.....	
100	.....	.70	.....	
150	.....	.95	.....	
200	.....	1.13	.....	
250	.....	1.33	.....	
300	.....	1.51	.....	
350	.....	1.69	.....	
400	.....	1.87	.52	
400	.....	1.95	.....	
500	.....	2.23	.....	
600	.....	2.49	.....	
700	.....	2.82	.....	
800	.....	3.11	.....	
900	.....	3.48	.....	= 11.6 per cent.
1,000	2,525	.....	.....	Tensile strength. Fractured along the scarf joint. The longer end of the specimen now tested, giving the strength of the leather.
1,998	5,045	.....	.....	Tensile strength of leather.

Fractured 1″ from face of jaws.

No. 5967.

6″ Single Leather Belting.

Actual dimensions:
Length, 60″.20.
Width, 6″.07.
Thickness, ″.22.
Sectional area, 6″.07 by ″.22=1.34 square inches.
Total weight, 2 pounds 11¾ ounces.
Weight per linear foot, 8.7 ounces.
Length between jaws of machine, 36″.
Gauged length, 30″.

[Has a scarf joint 5½″ long at middle of length.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inches.*	
0	0	0.	0.	
100	.....	.28	.....	
200	.....	.58	.....	
300	.....	.78	.....	
400	.....	.95	.....	
500	.....	1.11	.38	
600	.....	1.24	.....	
700	.....	1.40	.....	
800	.....	1.51	.....	
900	.....	1.64	.....	
1,000	.....	1.76	.70	
1,200	.....	2.00	.....	
1,400	.....	2.21	.....	
1,600	.....	2.38	.....	
1,800	.....	2.63	.....	
2,000	.....	2.81	1.21	
2,000	.....	2.88	.....	Width, 5″.96.
2,200	.....	3.05	.....	
2,400	.....	3.23	.....	
2,600	.....	3.38	.....	
2,800	.....	3.58	.....	Thin part of scarf has begun to fracture.
3,000	.....	3.78	.....	
3,200	.....	3.97	.....	=13,2 per cent.
3,400	2,537	.....	.....	Tensile strength.

Fracture at the scarf.

No. 5968.

6″ SINGLE LEATHER BELTING (waterproofed).

Actual dimensions:
Length, 60″.11.
Width, 6″.08.
Thickness, ″.24.
Sectional area, 6″.08 by ″.24 = 1.46 square inches.
Total weight, 3 pounds 00½ ounce.
Weight per linear foot, 9.6 ounces.
Length between jaws of machine, 36″.
Gauged length, 30″.

[Has a scarf joint 5¾″ long at middle of length.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
0	.....	0.	0.	
100	.....	.10	.....	
200	.....	.28	.....	
300	.....	.45	.....	
400	.....	.62	.....	
500	.....	.77	.12	
600	.....	.92	.....	
700	.....	1.07	.....	
800	.....	1.19	.....	
900	.....	1.32	.....	
1,000	.....	1.45	.48	
1,200	.....	1.67	.....	
1,400	.....	1.90	.....	
1,600	.....	2.12	.....	
1,800	.....	2.31	.....	
2,000	.....	2.53	.....	
2,200	.....	2.80	.....	
2,400	.....	2.95	.....	
2,600	.....	3.18	.....	
2,800	.....	3.37	.....	
3,000	.....	3.53	.....	
3,200	.....	3.80	.....	=12.6 per cent.
3,240	2,219	.....	.....	Tensile strength.

Fractured at the scarf joint.

No. 5965.

12″ SINGLE LEATHER BELTING.

Actual dimensions:
Length, 60″.11.
Width, 12″.05.
Thickness, ″.18.
Sectional area, 12″.05 by ″.18=2.17 square inches.
Total weight, 4 pounds 10¾ ounces.
Weight per linear foot, 14.9 ounces.
Length between jaws of machine, 36″.
Gauged length, 30″.

[Sample contains a scarf joint 6″ long near middle of length and included within the gauged length.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
0	0	0.	0.	
100	.....	.04	.....	
200	.....	.08	.....	
300	.....	.15	.....	
400	.....	.20	.....	
500	.....	.28	.....	
600	.....	.32	.....	
700	.....	.38	.....	
800	.....	.45	.....	
900	.....	.51	.....	
1,000	.....	.57	.02	
1,200	.....	.69	.....	
1,400	.....	.77	.....	
1,600	.....	.86	.....	
1,800	.....	.96	.....	
2,000	.....	1.05	.12	
2,200	.....	1.17	.....	
2,400	.....	1.24	.....	
2,600	.....	1.33	.....	
2,800	.....	1.42	.....	
3,000	.....	1.51	.30	
3,500	.....	1.76	.....	
4,000	.....	1.98	.....	
4,500	.....	2.24	.....	
5,000	.....	2.50	.....	
5,500	.....	2.75	.....	
6,000	.....	2.98	.....	
6,500	.....	3.18	.....	
7,000	.....	3.45	.....	
7,500	.....	3.70	.....	
8,000	.....	4.00	.....	=13.3 per cent.
8,500	3,917	.....	.....	Tensile strength.

Fractured at scarf joint.

No. 5966.

12″ SINGLE LEATHER BELTING (waterproofed).

Actual dimensions:
Length, 60″.30.
Width, 12″.05.
Thickness, ″.24.
Sectional area, 12″.05 by ″.24=2.89 square inches.
Total weight, 6 pounds ¾ ounce.
Weight per linear foot, 1 pound 3.2 ounces.
Length between jaws of testing machine, 36″.
Gauged length, 30″.

[Sample contains a scarf joint 5½″ long near middle of length and included in gauged length.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
0	0	0.	0.	
100	.....	.03	.....	
200	.....	.07	.....	
300	.....	.13	.....	
400	.....	.20	.....	
500	.....	.26	.....	
600	.....	.31	.....	
700	.....	.36	.....	
800	.....	.42	.....	
900	.....	.48	.....	
1,000	.....	.54	.03	
1,200	.....	.64	.....	
1,400	.....	.74	.....	
1,600	.....	.84	.....	
1,800	.....	.92	.....	
2,000	.....	1.01	.11	
2,200	.....	1.09	.....	
2,400	.....	1.18	.....	
2,600	.....	1.26	.....	
2,800	.....	1.35	.....	
3,000	.....	1.43	.27	
3,500	.....	1.62	.....	
4,000	.....	1.87	.....	= 6.2 per cent.
4,500	1,557	.....	.....	Tensile strength.

Fractured the scarf joint.

No. 5966*a*.

One end of No. 5966 returned to the testing machine and the strength of the solid leather determined.
Tensile strength, 10,400 pounds = 3,598 pounds per square inch.
Fractured 5″ from jaws.

No. 5964.

2″ Double Leather Belting.

Actual dimensions:
Length, 60″.
Width, 2″.07.
Thickness, ″.42.
Sectional area, 2″.07 by ″.42 = .869 square inch.
Total weight, 1 pound 10¾ ounces.
Weight per linear foot, 5.35 ounces.
Length between jaws of machine, 38″.
Gauged length, 30″.

[Specimen contains two scarf joints 4″ long each, one joint included within the gauged length, one-half being within the jaws, one-half outside the jaws.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inches.*	
0	0	0.	0.	
50	.....	.15	.....	
100	.....	.26	.....	
150	.....	.49	.....	
200	.....	.68	.....	
250	.....	.83	.....	
300	.....	.96	.....	
350	.....	1.08	.....	
400	.....	1.18	.28	
500	.....	1.43	.....	
600	.....	1.58	.....	
700	.....	1.73	.....	
800	.....	1.88	.....	
900	.....	2.05	.....	
1,000	.....	2.18	.87	
1,000	.....	2.27	.....	
.....	.....	2.44	.....	After sustaining load 1 hour.
1,100	.....	2.48	.....	
1,200	.....	2.57	.....	
1,300	.....	2.67	.....	
1,400	.....	2.78	.....	
1,500	.....	2.91	.....	
1,600	.....	3.06	.....	
1,700	.....	3.18	.....	
1,800	.....	3.33	.....	
1,900	.....	3.46	.....	
2,000	.....	3.61	1.56	
2,000	.....	3.72	.....	
2,100	.....	3.87	.....	
2,200	.....	3.97	.....	
2,300	.....	4.11	.....	
2,400	.....	4.29	.....	
2,500	.....	4.40	.....	
2,600	.....	4.52	.....	
2,700	.....	4.64	.....	
2,800	.....	4.78	.....	
2,900	.....	4.92	.....	
3,000	.....	5.06	2.16	
3,100	.....	5.23	.....	Width of belting, 1″.98.
3,200	.....	5.41	.....	
3,300	.....	5.51	.....	
3,400	.....	5.73	.....	—19.1 per cent.
3,498	4,025	.....	.....	Tensile strength.

Fractured at end of scarf joint, at the joint which was partly within the jaws of the testing machine.

No. 6214.

DOUBLE LEATHER BELTING, MADE BY LELAND TANNING COMPANY.

Actual dimensions:
Length, 59″.55.
Width, 3″.98.
Thickness, ″.33.
Sectional area, 3″.98 by ″.33=1.31 square inches.
Total weight, 2 pounds 9 ounces.
Weight per linear foot, 8.3 ounces.
Gauged length, 30″.

[Contains a scarf joint, cemented, in part included in the gauged length.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inches.*	
100	.....	.06	.....	
200	.....	.13	.....	
300	.....	.27	.....	
400	.....	.32	.....	
500	.....	.40	.....	
600	.....	.48	.....	
700	.....	.53	.....	
800	.....	.60	.....	
900	.....	.64	.....	
1,000	.....	.71	.12	
1,200	.....	.84	.....	
1,400	.....	.95	.....	
1,600	.....	1.06	.....	
1,800	.....	1.18	.....	
2,000	.....	1.32	.18	
.....	.....	.....	.08	Set after resting 15 hours.
2,000	.....	1.34	.....	
2,200	.....	1.50	.....	
2,400	.....	1.64	.....	
2,600	.....	1.77	.....	
2,800	.....	1.92	.....	
3,000	.....	2.06	.34	
3,200	.....	2.30	.....	
3,400	.....	2.45	.....	
3,600	.....	2.57	.....	
3,800	.....	2.71	.....	
4,000	.....	2.92	.....	
4,500	.....	3.25	.....	
4,800	.....	.....	.....	Scarf joint opened at end of joint.
5,000	.....	3.76	.....	
5,500	.....	4.03	.....	
6,000	.....	4.47	.....	
6,460	4,931	.....	.....	Tensile strength. Parted at the scarf joint. The two parts of the belting separated, leaving one part intact. The remaining part, which is without joint, now tested as a single belt.
0	.....	.....	1.12	
1,000	.....	2.90	.....	
1,500	.....	3.43	.....	
2,000	.....	3.91	.....	
2,500	.....	4.36	.....	
3,000	.....	4.82	.....	
3,500	.....	5.26	.....	
3,580	.....	.....	.....	Tensile strength.

Fractured near middle of length.

No. 5962.

6″ Double Leather Belting.

Actual dimensions:
Length, 60″.18.
Width, 5″.91.
Thickness, ″.47.
Sectional area, 5″.91 by ″.47=2.78 square inches.
Total weight, 5 pounds 5¼ ounces.
Weight per linear foot, 1 pound 1 ounce.
Length between jaws of machine, 36″.
Gauged length, 30″.

[Two scarf joints are included in the part of the belting between the jaws of the machine; one joint is included within the gauged length, and the other joint occurs at the extremity of the gauged length, one-half the scarf being outside.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inches.*	
0	.....	0.	0.	
100	.....	.01	.....	
200	.....	.09	.....	
300	.....	.21	.....	
400	.....	.32	.....	
500	.....	.42	.08	
600	.....	.52	.....	
700	.....	.60	.....	
800	.....	.67	.....	
900	.....	.76	.....	
1,000	.....	.83	.24	
1,200	.....	.96	.....	Snapping sounds from the cemented joints.
1,400	.....	1.09	.....	
1,600	.....	1.19	.....	
1,800	.....	1.30	.....	
2,000	.....	1.42	.50	
2,200	.....	1.52	.....	
2,400	.....	1.62	.....	
2,600	.....	1.71	.....	
2,800	.....	1.82	.....	
3,000	.....	1.92	.....	
3,500	.....	2.16	.....	
4,000	.....	2.38	.....	
4,500	.....	2.61	.....	
5,000	.....	2.86	1.01	Width, 5″.78.
5,000	.....	2.95	.....	
5,500	.....	3.18	.....	
6,000	.....	3.37	.....	
6,500	.....	3.62	.....	
7,000	.....	3.82	.....	
7,500	.....	4.10	.....	
8,000	.....	4.32	.....	
8,500	.....	4.56	.....	
9,000	.....	4.81	.....	
9,500	.....	5.00	.....	
10,000	.....	5.32	2.03	Width, 5″.54. Fracture has begun at thin end of scarf at one point.
10,500	.....	5.73	.....	
11,000	.....	5.90	.....	
11,500	.....	6.18	.....	=20.6 per cent.
11,980	4,309	.....	.....	Tensile strength.

Fractured at scarf joint.

No. 5963.

6″ Double Leather Belting (waterproofed).

Actual dimensions:
Length, 59″.93.
Width, 6″.
Thickness, ″.40.
Sectional area, 6″ by ″.40=2.40 square inches.
Total weight, 5 pounds 8¾ ounces.
Weight per linear foot, 1 pound 0.6 ounces.
Length between jaws of machine, 36″.
Gauged length, 30″.

[Two scarf joints in the same relative position as in No. 5962.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inches.*	
0	.....	0.	0.	
100	.....	.04	.....	
200	.....	.11	.....	
300	.....	.19	.....	
400	.....	.27	.....	
500	.....	.37	.03	
600	.....	.47	.....	
700	.....	.56	.....	
800	.....	.65	.....	
900	.....	.74	.....	
1,000	.....	.81	.19	
1,200	.....	.95	.....	
1,400	.....	1.07	.....	
1,600	.....	1.18	.....	
1,800	.....	1.31	.....	
2,000	.....	1.40	.50	
2,200	.....	1.51	.....	
2,400	.....	1.62	.....	
2,600	.....	1.73	.....	
2,800	.....	1.81	.....	
3,000	.....	1.91	.....	
3,500	.....	2.13	.....	
4,000	.....	2.39	.....	
4,500	.....	2.59	.....	
5,000	.....	2.89	1.10	Width, 5″.86.
5,500	.....	3.15	.....	
6,000	.....	3.35	.....	
6,500	.....	3.58	.....	
7,000	.....	3.83	.....	
7,500	.....	4.03	.....	Rested 1 hour under this load after elongation was measured.
8,000	.....	4.42	.....	
8,500	.....	4.53	.....	
9,000	.....	4.72	.....	
9,500	.....	4.90	.....	
10,000	.....	5.12	2.10	Width, 5″.63.
10,500	.....	5.64	.....	
11,000	.....	5.79	.....	
11,500	.....	5.98	.....	
12,000	.....	6.21	.....	= 20.7 per cent.
12,400	5,166	.....	.....	Tensile strength.

Fractured at scarf joint.

No. 5960.

12″ Double Leather Belting.

Actual dimensions:
Length, 59″.90.
Width, 11″.90.
Thickness, ″.39.
Sectional area, 11″.90 by ″.39=4.64 square inches.
Total weight, 9 pounds.
Weight per linear foot, 1 pound 12.8 ounces.
Gauged length, 30″.

[Belting contains two scarf joints, one of which is included in the gauged length.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
0	.....	0.	0.	
100	.....	0.	.....	
200	.....	.02	.....	
300	.....	.03	.....	
400	.....	.05	.....	
500	.....	.08	.....	
600	.....	.11	.....	
700	.....	.13	.....	
800	.....	.15	.....	
900	.....	.18	.....	
1,000	.....	.21	.02	
1,200	.....	.27	.....	
1,400	.....	.33	.....	
1,600	.....	.38	.....	
1,800	.....	.46	.....	
2,000	.....	.51	.10	
2,200	.....	.55	.....	
2,400	.....	.61	.....	
2,600	.....	.68	.....	
2,800	.....	.72	.....	
3,000	.....	.78	.20	
3,500	.....	.92	.....	
4,000	.....	1.04	.....	
4,500	.....	1.16	.....	
5,000	.....	1.26	.40	
6,000	.....	1.52	.....	
7,000	.....	1.74	.....	
8,000	.....	1.98	.....	
9,000	.....	2.30	.....	
10,000	.....	2.50	.80	
11,000	.....	2.80	.....	
12,000	.....	3.04	.....	
13,000	.....	3.29	.....	
14,000	.....	3.52	.....	
15,000	.....	3.76	.....	
16,000	.....	4.00	.....	
17,000	.....	4.23	.....	
18,000	.....	4.53	.....	=15.1 per cent.
18,980	4,090	.....	.....	Tensile strength.

The fracture began at one scarf joint and extended along the length of the belting to the other joint, a distance of 22″, separating the belting along the middle of its thickness where the two parts were cemented together.

No. 5961.

12″ DOUBLE LEATHER BELTING (waterproofed).

Actual dimensions:
Length, 60″.06.
Width, 11″.93.
Thickness, ″.36.
Sectional area, 11″.93 by ″.36=4.29 square inches.
Total weight, 9 pounds 6½ ounces.
Weight per linear foot, 1 pound 14 ounces.
Length between jaws of machine, 36″.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
0	0	0.	0.	
200	.....	.02	.....	
300	.....	.03	.....	
400	.....	.05	.....	
500	.....	.08	.....	
600	.....	.11	.....	
700	.....	.15	.....	
800	.....	.20	.....	
900	.....	.23	.....	
1,000	.....	.27	0.	
1,200	.....	.31	.....	
1,400	.....	.39	.....	
1,600	.....	.44	.....	
1,800	.....	.48	.....	
2,000	.....	.56	.06	
2,200	.....	.63	.....	
2,400	.....	.69	.....	
2,600	.....	.75	.....	
2,800	.....	.80	.....	
3,000	.....	.85	.12	
3,500	.....	.97	.....	
4,000	.....	1.10	.....	
4,500	.....	1.22	.....	
5,000	.....	1.33	.32	
6,000	.....	1.58	.....	
7,000	.....	1.79	.....	
8,000	.....	2.02	.....	
9,000	.....	2.26	.....	
10,000	.....	2.52	.....	
8,000	.....	2.35	.....	
6,000	.....	2.14	.....	
4,000	.....	1.90	.....	
2,000	.....	1.52	.....	
1,000	.....	1.26	.....	
0	.....	.....	.75	
1,000	.....	1.05	.....	
2,000	.....	1.28	.....	
4,000	.....	1.64	.....	
6,000	.....	1.96	.....	
8,000	.....	2.27	.....	
10,000	.....	2.60	.....	
11,000	.....	2.82	.....	
12,000	.....	3.08	.....	
13,000	.....	3.30	.....	
14,000	.....	3.54	.....	
15,000	.....	3.80	.....	
16,000	.....	4.02	.....	
17,000	.....	4.31	.....	
18,000	.....	4.62	.....	= 15.4 per cent.
18,980	4,424	.....	.....	Tensile strength.

This belting had two scarf joints, one in each part, in the section between the jaws of the machine.

Fracture occurred 4″ from the joint.

No. 5959.

24″ DOUBLE LEATHER BELTING (waterproofed).

Actual dimensions:
Length, 60″.
Width, 23″.90.
Thickness, ″.47.
Sectional area, 23″.9 by ″.47=11.23 square inches.
Total weight, 22 pounds 8 ounces.
Weight per linear foot, 4 pounds 8 ounces.
Length between jaws of machine, 34″.
Gauged length (covering 1½″ of a scarf joint in the belt), 20″.

[This specimen contained two scarf joints which were cemented; one joint in each ply of its thickness. The scarf joints were about 5″ long. The joint on one side was about 29″ from the joint on the other side of the belting.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
100	.....	0.	0.	Initial load.
200	.....	.01	.....	
300	.....	.03	.....	
400	.....	.04	.....	
500	.....	.04	.....	
600	.....	.05	.....	
700	.....	.06	.....	
800	.....	.07	.....	
900	.....	.08	.....	
1,000	.....	.09	.02	
1,200	.....	.10	.....	
1,400	.....	.11	.....	
1,600	.....	.12	.....	
1,800	.....	.15	.....	Snapping sounds.
2,000	.....	.17	.03	
2,200	.....	.20	.....	Frequent repetition of snapping sounds, attributed to cement in scarf joints.
2,400	.....	.22	.....	
2,600	.....	.25	.....	
2,800	.....	.27	.....	
3,000	.....	.29	.06	
3,200	.....	.32	.....	
3,400	.....	.34	.....	
3,600	.....	.36	.....	
3,800	.....	.38	.....	
4,000	.....	.41	.....	
3,000	.....	.37	.....	
2,000	.....	.32	.....	
1,000	.....	.24	.....	
100	.....	.....	.12	
1,000	.....	.21	.....	
2,000	.....	.29	.....	
3,000	.....	.36	.....	
4,000	.....	.41	.....	
4,500	.....	.45	.....	
5,000	.....	.51	.....	
5,500	.....	.55	.....	
6,000	.....	.60	.....	
6,500	.....	.64	.....	
7,000	.....	.69	.....	
7,500	.....	.73	.....	
8,000	.....	.76	.....	
8,500	.....	.81	.....	
9,000	.....	.85	.....	
9,500	.....	.88	.....	
10,000	.....	.92	.....	
9,000	.....	.90	.....	
8,000	.....	.87	.....	
7,000	.....	.84	.....	
6,000	.....	.80	.....	
5,000	.....	.76	.....	

No. 5959—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
4,000	.....	.70	.....	
3,000	.....	.66	.....	
2,000	.....	.58	.....	
1,000	.....	.48	.....	
100	.....	.....	.33	
1,000	.....	.40	.....	
2,000	.....	.49	.....	
3,000	.....	.56	.....	
4,000	.....	.63	.....	
5,000	.....	.68	.....	
6,000	.....	.74	.....	
7,000	.....	.79	.....	
8,000	.....	.84	.....	
9,000	.....	.89	.....	
10,000	.....	.95	.....	
10,500	.....	.98	.....	
11,000	.....	1.02	.....	
11,500	.....	1.05	.....	
12,000	.....	1.08	.....	
12,500	.....	1.12	.....	
13,000	.....	1.17	.....	
13,500	.....	1.20	.....	
14,000	.....	1.25	.....	
14,500	.....	1.30	.....	
15,000	.....	1.33	.....	
15,500	.....	1.37	.....	
16,000	.....	1.40	.....	
16,500	.....	1.44	.....	
17,000	.....	1.48	.....	
17,500	.....	1.52	.....	Belting shows a roughened appearance in the vicinity of the scarf joints.
18,000	.....	1.56	.....	
18,500	.....	1.62	.....	
19,000	.....	1.68	.....	
19,500	.....	1.71	.....	
20,000	.....	1.75	.....	
18,000	.....	1.70	.....	
15,000	.....	1.60	.....	
10,000	.....	1.45	.....	
5,000	.....	1.21	.....	
2,000	.....	.95	.....	
1,000	.....	.84	.....	
100	.....	.....	.66	
1,000	.....	.74	.....	
2,000	.....	.81	.....	
5,000	.....	1.01	.....	
10,000	.....	1.28	.....	
15,000	.....	1.51	.....	
18,000	.....	1.67	.....	
20,000	.....	1.77	.....	
20,500	.....	1.82	.....	
21,000	.....	1.86	.....	
21,500	.....	1.90	.....	
22,000	.....	1.92	.....	
23,000	.....	1.98	.....	
24,000	.....	2.02	.....	
25,000	.....	2.10	.....	
26,000	.....	2.16	.....	
27,000	.....	2.22	.....	
28,000	.....	2.30	.....	
29,000	.....	2.36	.....	
30,000	.....	2.42	.....	= 12.1 per cent.
31,000	2,760	.....	.....	Tensile strength.

Belting fractured at a scarf joint, beginning at the middle of the width.

Test discontinued when the fracture was 15″ long, the fracture not at the time having extended to the sides of the belting.

The other side of the belting did not fracture.

No. 5958.

30″ Double Leather Belting.

Actual dimensions:
Length, 59″.90.
Width, 29″.95.
Thickness, ″.43.
Sectional area, 29″.95 by ″.43=12.88 square inches.
Total weight, 24 pounds 4 ounces.
Weight per linear foot, 4 pounds 12.7 ounces.
Length between jaws of machine, 34″.
Gauged length (covering 4″ of one scarf joint), 20″.

[Each side of this belting contains a scarf joint, 5″ lap. The joints are 23½″ apart on the opposite sides.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
100	.....	0.	0.	Initial load.
200	.....	.01	.....	
400	.....	.02	.....	
600	.....	.03	.....	
800	.....	.05	.....	
1,000	.....	.07	.01	
1,200	.....	.09	.....	
1,400	.....	.11	.....	
1,600	.....	.13	.....	
1,800	.....	.14	.....	
2,000	.....	.16	.01	Snapping sounds.
2,200	.....	.18	.....	
2,400	.....	.20	.....	
2,600	.....	.21	.....	
2,800	.....	.24	.....	
3,000	.....	.26	.03	
3,200	.....	.28	.....	
3,400	.....	.30	.....	
3,600	.....	.33	.....	
3,800	.....	.35	.....	
4,000	.....	.37	.10	
4,500	.....	.41	.....	
5,000	.....	.45	.....	
5,500	.....	.50	.....	
6,000	.....	.54	.....	
6,500	.....	.57	.....	
7,000	.....	.61	.....	
7,500	.....	.65	.....	
8,000	.....	.70	.....	
8,500	.....	.72	.....	
9,000	.....	.76	.....	
9,500	.....	.80	.....	
10,000	.....	.83	.....	
8,000	.....	.78	.....	
6,000	.....	.71	.....	
4,000	.....	.62	.....	
2,000	.....	.51	.....	
1,000	.....	.44	.28	
.....	.....	.....	.21	After resting under initial load 15 hours.
1,000	.....	.30	.....	
2,000	.....	.36	.....	
4,000	.....	.48	.....	
6,000	.....	.59	.....	
8,000	.....	.70	.....	
10,000	.....	.81	.....	
10,500	.....	.85	.....	
11,000	.....	.87	.....	
11,500	.....	.91	.....	
12,000	.....	.95	.....	
12,500	.....	.97	.....	
13,000	.....	1.00	.....	
13,500	.....	1.03	.....	

No. 5958—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
14,000		1.06		
14,500		1.09		
15,000		1.12		
		1.16		After 5 minutes.
12,000		1.09		
		1.09		After 2 minutes.
10,000		1.04		
		1.04		Do.
8,000		.98		
		.98		Do.
6,000		.91		
		.91		Do.
4,000		.81		
		.80		Do.
2,000		.68		
		.67		Do.
1,000		.58		
		.57		Do.
100			.37	
			.37	Do.
1,000		.48		
		.48		Do.
2,000		.56		
		.56		Do.
4,000		.69		
		.69		Do.
6,000		.78		
		.79		Do.
8,000		.89		
		.89		Do.
10,000		.98		
		.98		Do.
12,000		1.06		
		1.06		Do.
15,000		1.18		
		1.19		Do.
15,500		1.22		
16,000		1.25		
16,500		1.26		
17,000		1.29		
17,500		1.31		
18,000		1.34		
18,500		1.37		
19,000		1.40		
19,500		1.43		
20,000		1.45		
21,000		1.52		
22,000		1.58		
23,000		1.64		
24,000		1.69		
25,000		1.74		
26,000		1.84		
27,000		1.92		
28,000		2.00	.46	
29,000		2.07		
30,000		2.14		
31,000		2.19		
32,000		2.25		
33,000		2.32		
34,000		2.38		
35,000	2,717	2.46		=12.3 per cent. Tensile strength.

Fractured one side of the belting, beginning at the middle of its width, at the scarf joint.

As the fracture extended toward the edges of the belting the two parts separated along the cemented seam at the middle of its thickness.

No. 5952.

2″ RUBBER BELTING—4-PLY.

Actual dimensions:
Length, 60″.17.
Width, 2″.02.
Thickness, ″.26.
Sectional area, 2″.02 by ″.26=.525 square inch.
Total weight, 1 pound 6 ounces.
Weight per linear foot, 4.4 ounces.
Length between jaws of machine, 34″
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inches.*	
0	.....	0.	0.	
50	.....	.79	.....	
100	.....	1.35	.....	
150	.....	1.76	.....	
200	.....	2.11	.25	
250	.....	2.57	.....	
300	.....	3.01	.....	
350	.....	3.14	.....	
400	.....	3.33	.....	
450	.....	3.56	.....	
500	.....	3.75	1.12	
550	.....	3.92	.....	
600	.....	4.10	.....	
650	.....	4.26	.....	
700	.....	4.40	.....	
750	.....	4.55	.....	
800	.....	4.69	.....	
900	.....	4.95	.....	
1,000	.....	5.21	1.80	Width of belt, 1″.84.
1,100	.....	5.55	.....	
1,200	.....	5.72	.....	
1,300	.....	5.93	.....	
1,400	.....	6.09	.....	
1,500	.....	6.28	2.30	Width of belt, 1″.79.
1,600	.....	6.58	.....	
1,700	.....	6.73	.....	=22.4 per cent.
1,720	3,276	.....	.....	Tensile strength.

Fractured at face of jaws of machine.
Elongation in 30″, 1.76=5.9 per cent.

No. 5949.

6″ RUBBER BELTING—4-PLY.

Actual dimensions: Length, 60″.17. Width, 6″.08. Thickness, ″.26.
Sectional area, 6″.08 by ″.26=1.58 square inches.
Total weight, 4 pounds 2¼ ounces.
Weight per linear foot, 13.2 ounces.
Length between jaws of machine, 40″.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inches.*	
0	0	0.	0.	
50	.....	.22	.....	
100	.....	.34	.....	
150	.....	.51	.....	
200	.....	.60	.....	
250	.....	.72	.....	
300	.....	.83	.....	
350	.....	.92	.....	
400	.....	1.00	.19	
450	.....	1.11	.....	
500	.....	1.17	.....	
550	.....	1.24	.....	
600	.....	1.29	.....	
650	.....	1.38	.....	
700	.....	1.43	.....	
750	.....	1.50	.....	
800	.....	1.55	.....	
850	.....	1.61	.....	
900	.....	1.67	.....	
950	.....	1.72	.....	
1,000	.....	1.79	.40	Width, 5″.88.
1,100	.....	1.91	.....	
1,200	.....	2.00	.....	
1,300	.....	2.08	.....	
1,400	.....	2.17	.....	
1,500	.....	2.27	.....	
1,600	.....	2.36	.....	
1,700	.....	2.46	.....	
1,800	.....	2.53	.....	
1,900	.....	2.61	.....	
2,000	.....	2.70	.....	
		2.81	.72	After 5 minutes. Width, 5″.77.
2,200	.....	2.97	.....	
2,400	.....	3.08	.....	
2,600	.....	3.23	.....	
2,800	.....	3.33	.....	
3,000	.....	3.46	.....	Width, 5″.70.
2,500	.....	3.49	.....	
2,000	.....	3.40	.....	
1,500	.....	3.27	.....	
1,000	.....	3.10	.....	
0	.....	.....	1.14	
.....	.....	.....	1.00	After 60 minutes' rest.
1,000	.....	2.46	.....	
1,500	.....	2.80	.....	
2,000	.....	3.08	.....	
2,500	.....	3.32	.....	
3,000	.....	3.56	.....	
3,200	.....	3.66	.....	
3,400	.....	3.76	.....	
3,600	.....	3.87	.....	
3,800	.....	4.00	.....	
4,000	.....	4.12	.....	Width, 5″.63.
		4.28	1.64	After 5 minutes.
4,200	.....	4.40	.....	
4,400	.....	4.47	.....	
4,600	.....	4.55	.....	
4,800	.....	4.66	.....	
5,000	.....	4.73	.....	=15.8 per cent. Width, 5″.55.
0	.....	.....	1.97	
5,100	3,227	.....	.....	Tensile strength.

Fractured 3″ from jaws of machine.

No. 5950.

6″ RUBBER BELTING—4-PLY.

Actual dimensions:
Length, 60″.12.
Width, 6″.13.
Thickness, ″.26.
Sectional area, 6″.13 by ″.26=1.59 square inches.
Total weight, 4 pounds 4 ounces.
Weight per linear foot, 13.6 ounces.
Length between jaws of testing machine, 36″.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
0	.....	0.	0.	
100	.....	.13	.....	
200	.....	.50	.....	
300	.....	.81	.....	
400	.....	1.00	.....	
500	.....	1.22	.19	
600	.....	1.40	.....	
700	.....	1.65	.....	
800	.....	1.80	.....	
900	.....	1.96	.....	
1,000	.....	2.16	.54	
1,200	.....	2.46	.....	Width, 5″.92.
1,400	.....	2.74	.....	
1,600	.....	2.98	.....	
1,800	.....	3.21	.....	
2,000	.....	3.42	.....	
2,200	.....	3.61	.....	
2,400	.....	3.84	.....	
2,600	.....	4.05	.....	
2,800	.....	4.21	.....	
3,000	.....	4.38	.....	
3,200	.....	4.55	.....	
3,400	.....	4.68	.....	
3,600	.....	4.82	.....	
3,800	.....	4.97	.....	
4,000	.....	5.16	.....	
4,500	.....	5.41	.....	
5,000	.....	5.75	.....	
5,500	.....	6.03	.....	= 20.1 per cent.
6,000	37.73	.....	.....	Tensile strength.

Fractured 12″ from face of jaws.

No. 5951.

6″ Rubber Belting—4-ply.

Actual dimensions:
Length, 60″.17.
Width, 6″.05.
Thickness, ″.26.
Sectional area, 6″.05 by ″.26=1.57 square inches.
Total weight, 4 pounds 1¼ ounces.
Weight per linear foot, 13 ounces.
Length between jaws of machine, 40″.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inches.*	
0	0	0.	0.	
50	.....	.28	.....	
100	.....	.46	.....	
150	.....	.61	.....	
200	.....	.74	.....	
250	.....	.87	.....	
300	.....	.97	.....	
350	.....	1.06	.....	
400	.....	1.14	.20	
450	.....	1.26	.....	
500	.....	1.34	.....	
550	.....	1.38	.....	
600	.....	1.45	.....	
650	.....	1.53	.....	
700	.....	1.61	.....	
750	.....	1.66	.....	
800	.....	1.72	.....	
850	.....	1.78	.....	
900	.....	1.82	.....	
950	.....	1.87	.....	
1,000	.....	1.93	.35	Width, 5″.92.
1,100	.....	2.06	.....	
1,200	.....	2.14	.....	
1,300	.....	2.23	.....	
1,400	.....	2.31	.....	
1,500	.....	2.38	.....	
1,600	.....	2.47	.....	
1,700	.....	2.56	.....	
1,800	.....	2.62	.....	
1,900	.....	2.70	.....	
2,000	.....	2.75	.66	Width, 5″.83.
2,200	.....	2.92	.....	
2,400	.....	3.07	.....	
2,600	.....	3.19	.....	
2,800	.....	3.30	.....	
3,000	.....	3.41	1.13	Width, 5″.75.
3,200	.....	3.64	.....	
3,400	.....	3.72	.....	
3,600	.....	3.80	.....	
3,800	.....	3.89	.....	
4,000	.....	4.00	1.28	Width, 5‴.67.
4,200	.....	4.15	.....	=13.8 per cent.
4,300	2,739	.....	.....	Tensile strength.

Fractured at jaws of machine.

No. 5947.

12″ Rubber Belting—4-ply.

Actual dimensions:
Length, 60″.02.
Width, 12″.08.
Thickness, ″.27.
Sectional area, 12″.08 by ″.27 = 3.26 square inches.
Total weight, 8 pound 9¼ ounces.
Weight per linear foot, 1 pound 11.4 ounces.
Length between jaws of machine, 40″.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inches.*	
0.	0	0	0.	
100	.....	.18	.....	
150	.....	.25	.....	
200	.....	.35	.....	
250	.....	.46	.....	
300	.....	.56	.....	
350	.....	.65	.....	
400	.....	.75	.20	
450	.....	.81	.....	
500	.....	.89	.....	
550	.....	.99	.....	
600	.....	1.06	.....	
650	.....	1.14	.....	
700	.....	1.21	.....	
750	.....	1.27	.....	
800	.....	1.36	.....	
850	.....	1.44	.....	
900	.....	1.51	.....	
950	.....	1.59	.....	
1,000	.....	1.65	.27	
1,100	.....	1.80	.....	
1,200	.....	1.91	.....	
1,300	.....	2.04	.....	
1,400	.....	2.15	.....	
1,500	.....	2.24	.....	
1,600	.....	2.37	.....	
1,700	.....	2.47	.....	
1,800	.....	2.58	.....	
1,900	.....	2.69	.....	
2,000	.....	2.78	.73	Width, 11″.96.
2,200	.....	3.00	.....	
2,400	.....	3.17	.....	
2,600	.....	3.32	.....	
2,800	.....	3.50	.....	
3,000	.....	3.63	1.02	Width, 11″.93.
3,200	.....	3.87	.....	
3,400	.....	4.01	.....	
3,600	.....	4.13	.....	
3,800	.....	4.24	.....	
4,000	.....	4.36	1.45	Width, 11″.88.
4,200	.....	4.52	.....	
4,400	.....	4.67	.....	
4,600	.....	4.76	.....	
4,800	.....	4.86	.....	
5,000	.....	4.94	1.93	Width, 11″.83.
5,200	.....	5.11	.....	
5,400	.....	5.21	.....	
5,600	.....	5.31	.....	
5,800	.....	5.39	.....	
6,000	.....	5.47	2.24	Width, 11″.79.
6,500	.....	5.68	.....	
7,000	.....	5.86	.....	
7,500	.....	6.02	.....	
8,000	.....	6.22	.....	
8,500	.....	6.40	.....	
9,000	.....	6.54	.....	
9,500	.....	6.79	.....	= 22.6 per cent.
9,900	3,037	.....	.....	Tensile strength.

Fractured 10″ inside the gauged length.

No. 5948.

12″ RUBBER BELTING—4-PLY.

Actual dimensions:
Length, 60″.14.
Width, 12″.24.
Thickness, ″.26.
Sectional area, 12″.24 by ″.26 = 3.18 square inches.
Total weight, 8 pounds $9\frac{3}{4}$ ounces.
Weight per linear foot, 1 pound 11.5 ounces.
Length between jaws of machine, 36″.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
0	0	0.	0.	
100	.....	.08	.....	
200	.....	.26	.....	
300	.....	.41	.....	
400	.....	.53	.....	
500	.....	.68	.....	
600	.....	.81	.....	
700	.....	.92	.....	
800	.....	1.03	.....	
900	.....	1.13	.....	
1,000	.....	1.23	.24	
1,200	.....	1.41	.....	
1,400	.....	1.61	.....	
1,600	.....	1.76	.....	
1,800	.....	1.91	.....	
2,000	.....	2.05	.44	
2,200	.....	2.20	.....	
2,400	.....	2.32	.....	
2,600	.....	2.44	.....	
2,800	.....	2.54	.....	
3,000	.....	2.70	.62	
3,200	.....	2.87	.....	
3,400	.....	2.95	.....	
3,600	.....	3.04	.....	
3,800	.....	3.13	.....	
4,000	.....	3.24	.....	
4,500	.....	3.40	.....	
5,000	.....	3.68	.....	
5,500	.....	3.91	.....	
6,000	.....	4.10	.....	Width, 11″.50.
6,500	.....	4.31	.....	
7,000	.....	4.52	.....	
7,500	.....	4.68	.....	
8,000	.....	4.89	.....	
8,500	.....	5.06	.....	
9,000	.....	5.21	.....	=17.4 per cent.
9,500	2,987	.....	.....	Tensile strength.

Fractured near middle of length, beginning at one edge.

No. 5946.

2″ RUBBER BELTING—6-PLY.

Actual dimensions:
Length, 60″.17.
Width, 2″.14.
Thickness, ″.36.
Sectional area, 2″.14 by ″.36=.770 square inch.
Total weight, 1 pound 14¼ ounces.
Weight per linear foot, 6 ounces.
Length between jaws of machine, 34″.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inches.*	
0	0	0.	0.	Width, 2″.14.
50	.....	.63	.....	
100	.....	.95	.....	
150	.....	1.23	.....	
200	.....	1.44	.32	
250	.....	1.68	.....	
300	.....	1.85	.....	
350	.....	2.02	.....	
400	.....	2.17	.....	
450	.....	2.30	.....	
500	.....	2.46	.50	
550	.....	2.58	.....	Width, 2″.08.
600	.....	2.75	.....	
650	.....	2.82	.....	
700	.....	2.90	.....	
750	.....	3.01	.....	
800	.....	3.09	.....	
900	.....	3.27	.....	
1,000	.....	3.46	.90	
1,100	.....	3.63	.....	Width, 2″.05.
1,200	.....	3.80	.....	
1,300	.....	3.94	.....	
1,400	.....	4.07	.....	
1,500	.....	4.22	1.28	
1,600	.....	4.39	.....	Width, 2″.02.
1,700	.....	4.53	.....	
1,800	.....	4.62	.....	
1,900	.....	4.71	.....	
2,000	.....	4.84	1.73	
2,100	.....	5.02	.....	Width, 1″.99.
2,200	.....	5.14	.....	
2,300	.....	5.23	.....	= 17.4 per cent.
2,390	3,104	.....	.....	Tensile strength.

Fractured 4″ from face of jaws.

No. 5944.

6″ RUBBER BELTING—6-PLY.

Actual dimensions:
Length, 59″.98.
Width, 6″.26.
Thickness, ″.37.
Sectional area, 6″.26 by ″.37=2.32 square inches.
Total weight, 5 pounds 15¼ ounces.
Weight per linear foot, 1 pound 3.1 ounces.
Length between jaws of machine, 40″.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inches.*	
0	.....	0.	0.	
50	.....	.15	.....	
100	.....	.30	.....	
150	.....	.49	.....	
200	.....	.58	.....	
250	.....	.71	.....	
300	.....	.81	.....	
350	.....	.91	.....	
400	.....	1.00	.19	
450	.....	1.14	.....	
500	.....	1.17	.....	
550	.....	1.24	.....	
600	.....	1.31	.....	
650	.....	1.39	.....	
700	.....	1.46	.....	
750	.....	1.53	.....	
800	.....	1.58	.....	
850	.....	1.64	.....	
900	.....	1.70	.....	
950	.....	1.76	.....	
1,000	.....	1.81	.32	Width of belt, 6″.08.
1,100	.....	1.97	.....	
1,200	.....	2.05	.....	
1,300	.....	2.14	.....	
1,400	.....	2.23	.....	
1,500	.....	2.30	.....	
1,600	.....	2.40	.....	
1,700	.....	2.48	.....	
1,800	.....	2.56	.....	
1,900	.....	2.62	.....	
2,000	.....	2.70	.70	Width, 6″.02.
2,200	.....	2.90	.....	
2,400	.....	3.02	.....	
2,600	.....	3.14	.....	
2,800	.....	3.25	.....	
3,000	.....	3.39	.98	Width, 5″.96.
3,200	.....	3.57	.....	
3,400	.....	3.68	.....	
3,600	.....	3.79	.....	
3,800	.....	3.88	.....	
4,000	.....	3.97	1.18	Width, 5″.88.
4,200	.....	4.16	.....	
4,400	.....	4.26	.....	
4,600	.....	4.39	.....	
4,800	.....	4.45	.....	
5,000	.....	4.53	1.63	Width, 5″.83.
5,200	.....	4.67	.....	
5,400	.....	4.76	.....	
5,600	.....	4.85	.....	
5,800	.....	4.93	.....	
6,000	.....	5.01	1.76	Width, 5″.78.
6,200	.....	5.18	.....	=17.3 per cent.
6,350	2,737	.....	.....	Tensile strength.

Fractured at face of jaws.

No. 5945.

6″ RUBBER BELTING—6-PLY.

Actual dimensions:
Length, 60″.08.
Width, 6″.27.
Thickness, ″.36.
Sectional area, 6″.27 by ″.36 = 2.26 square inches.
Total weight, 5 pounds 14¾ ounces.
Weight per linear foot, 1 pound 2.9 ounces.
Length between jaws of testing machine, 36″
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds	*Pounds.*	*Inches.*	*Inch.*	
0	.....	0.	.....	
100	.....	.12	.....	
200	.....	.34	.....	
300	.....	.54	.....	
400	.....	.76	.....	
500	.....	.88	.05	
600	.....	1.03	.....	
700	.....	1.18	.....	
800	.....	1.28	.....	
900	.....	1.42	.....	
1,000	.....	1.56	.36	Width, 6″.05.
1,200	.....	1.82	.....	
1,400	.....	2.06	.....	
1,600	.....	2.26	.....	
1,800	.....	2.47	.....	
2,000	.....	2.61	.....	
2,000	.....	2.77	.....	After 4 minutes.
2,000	.....	2.82	.....	After 10 minutes.
2,200	.....	2.88	.....	
2,400	.....	3.00	.....	
2,600	.....	3.14	.....	
2,800	.....	3.31	.....	
3,000	.....	3.48	.....	
3,500	.....	3.78	.....	
4,000	.....	4.21	.....	
4,500	.....	4.45	.....	
5,000	.....	4.84	.....	
5,500	.....	5.03	.....	
6,000	.....	5.25	.....	
6,500	.....	5.49	.....	
7,000	.....	5.74	.....	
7,500	.....	5.98	.....	
8,000	.....	.....	.....	Surface of rubber cracked in one place.
8,520	3,770	.....	.....	Tensile strength.

Fractured near middle of length at the place the rubber had previously cracked.

No. 5942.

12″ RUBBER BELTING—6-PLY.

Actual dimensions:
Length, 60″.15.
Width, 12″.04.
Thickness, ″.36.
Sectional area, 12″.04 by ″.36 = 4.33 square inches.
Total weight, 11 pounds $2\frac{3}{4}$ ounces.
Weight per linear foot, 2 pounds 3.7 ounces.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
0	0	0.	0.	
100	.....	.06	.....	
200	.....	.19	.....	
300	.....	.29	.....	
400	.....	.36	.....	
500	.....	.43	.....	
600	.....	.48	.....	
700	.....	.56	.....	
800	.....	.60	.....	
900	.....	.66	.....	
1,000	.....	.70	.19	
1,200	.....	.76	.....	
1,400	.....	.85	.....	
1,600	.....	.92	.....	
1,800	.....	.98	.....	
2,000	.....	1.04	.22	
2,200	.....	1.11	.....	
2,400	.....	1.18	.....	
2,600	.....	1.24	.....	
2,800	.....	1.31	.....	
3,000	.....	1.36	.32	
3,500	.....	1.50	.....	
4,000	.....	1.63	.....	
4,500	.....	1.78	.....	
5,000	.....	1.90	.45	
6,000	.....	2.14	.....	
7,000	.....	2.42	.....	
8,000	.....	2.65	.....	
9,000	.....	2.90	.....	
10,000	.....	3.12	.97	
11,000	.....	3.33	.....	
12,000	.....	3.52	.....	
13,000	.....	3.72	.....	
14,000	.....	3.91	.....	=13 per cent.
14,880	3,436	.....	.....	Tensile strength.
0	0	.81	.....	=2.7 per cent.

Fractured at face of jaws of machine.

No. 5943.

12″ RUBBER BELTING—6-PLY.

Actual dimensions:
Length, 60″.17.
Width, 12″.16.
Thickness, ″.34.
Sectional area, 12″.16 by ″.34 = 4.13 square inches.
Total weight, 11 pounds 3¼ ounces.
Weight per linear foot, 2 pounds 3.7 ounces.
Length between jaws of machine, 36″.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inches.*	
0	0	0.	0.	
100	.....	.03	.....	
200	.....	.09	.....	
300	.....	.19	.....	
400	.....	.26	.....	
500	.....	.32	.....	
600	.....	.38	.....	
700	.....	.44	.....	
800	.....	.51	.....	
900	.....	.55	.....	
1,000	.....	.58	0.	
1,200	.....	.69	.....	
1,400	.....	.75	.....	
1,600	.....	.84	.....	
1,800	.....	.90	.....	
2,000	.....	.97	.06	
2,200	.....	1.05	.....	
2,400	.....	1.14	.....	
2,600	.....	1.18	.....	
2,800	.....	1.26	.....	
3,000	.....	1.34	.33	
3,500	.....	1.53	.....	
4,000	.....	1.70	.....	
4,500	.....	1.86	.....	
5,000	.....	2.07	.50	
6,000	.....	2.38	.....	
7,000	.....	2.70	.....	
8,000	.....	2.92	.....	
9,000	.....	3.28	.....	
10,000	.....	3.47	.....	
8,000	.....	3.43	.....	
6,000	.....	3.33	.....	
4,000	.....	3.14	.....	
2,000	.....	2.86	.....	
1,000	.....	2.53	.....	
0	.....	.....	1.27	
0	.....	.....	1.20	After resting 1 hour.
1,000	.....	1.67	.....	
2,000	.....	2.02	.....	
4,000	.....	2.52	.....	
6,000	.....	2.96	.....	
8,000	.....	3.28	.....	
10,000	.....	3.62	.....	
11,000	.....	3.81	.....	
12,000	.....	4.02	.....	
13,000	.....	4.23	.....	
14,000	.....	4.40	.....	
15,000	.....	4.62	.....	=15.4 per cent.
15,950	3,862	.....	.....	Tensile strength.

Fractured at middle of length.

No. 5941.

24″ RUBBER BELTING—6-PLY.

Actual dimensions:
Length, 60″.13.
Width, 24″.11.
Thickness, ″.41.
Sectional area, 24″.11 by ″.41 = 9.89 square inches.
Total weight, 24 pounds 8 ounces.
Weight per linear foot, 4 pounds 14.2 ounces.
Length of belt between jaws of machine, 34″.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inches.*	
100		0.	0.	Initial load.
200		.08		
300		.15		
400		.21		
500		.28		
600		.35		
700		.41		
800		.48		
900		.53		
1,000		.57	.16	
1,100		.63		
1,200		.68		
1,300		.72		
1,400		.77		
1,500		.82		
1,600		.86		
1,700		.90		
1,800		.94		
1,900		.97		
2,000		1.03	.21	
2,000		1.04		
		1.06		After 3 minutes.
2,500		1.18		
		1.22		Do.
3,000		1.33		
		1.37	.26	Do.
3,500		1.47		
4,000		1.59		
		1.64		Do.
3,000		1.58		
2,000		1.44		
1,000		1.13	.31	
1,000		.80		
2,000		1.19		
3,000		1.45		
4,000		1.65		
4,500		1.72		
5,000		1.83		
5,500		1.92		
6,000		2.01		
6,500		2.10		
7,000		2.19		
7,500		2.25		
8,000		2.34		
8,500		2.43		
9,000		2.48		
9,500		2.54		
10,000		2.61		
		2.65		Do.
9,000		2.62		
8,000		2.60		
7,000		2.57		
6,000		2.52		
5,000		2.45		
4,000		2.36		

No. 5941—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inches.*	
3,000	.....	2.25	.....	
2,000	.....	2.03	.....	
1,000	.....	1.68	.76	
1,000	.....	1.19	.....	
2,000	.....	1.56	.....	
3,000	.....	1.82	.....	
4,000	.....	2.00	.....	
5,000	.....	2.16	.....	
6,000	.....	2.28	.....	
7,000	.....	2.40	.....	
8,000	.....	2.49	.....	
9,000	.....	2.57	.....	
10,000	.....	2.67	.....	Width of belt, 23″.25.
11,000	.....	2.79	.....	
12,000	.....	2.89	.....	
13,000	.....	2.98	.....	
14,000	.....	3.08	.....	
15,000	.....	3.22	1.35	
16,000	.....	3.35	.....	
17,000	.....	3.45	.....	
18,000	.....	3.55	.....	
19,000	.....	3.61	.....	
20,000	.....	3.72	1.69	
21,000	.....	3.82	.....	
22,000	.....	3.88	.....	
23,000	.....	3.95	.....	= 19.7 per cent.
23,550	2,381	.....	.....	Tensile strength.
0	0	.73	.....	= 3.6 per cent.

Fractured at face of jaws.

No. 5940.

30″ RUBBER BELTING—6-PLY.

Actual dimensions:
Length, 60″.04.
Width, 30″.18.
Thickness, ″.40.
Sectional area, 30″.18 by ″.40 = 12.07 square inches.
Total weight, 30 pounds 12 ounces.
Weight per linear foot, 6 pounds 2.3 ounces.
Length between jaws of machine, 34″.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
100	.....	0.	0.	Initial load.
200	.....	.05	.....	
300	.....	.09	.....	
400	.....	.13	.....	
500	.....	.20	.....	
600	.....	.24	.....	
700	.....	.28	.....	
800	.....	.33	.....	
900	.....	.37	.....	
1,000	.....	.42	.06	
1,200	.....	.51	.....	
1,400	.....	.57	.....	
1,600	.....	.64	.....	
1,800	.....	.70	.....	
2,000	.....	.75	.11	
2,200	.....	.84	.....	
2,400	.....	.89	.....	
2,600	.....	.97	.....	Rested 5 minutes.
2,800	.....	1.02	.....	
3,000	.....	1.07	.17	
3,200	.....	1.11	.....	
2,400	.....	1.16	.....	
3,600	.....	1.18	.....	
3,800	.....	1.23	.....	
4,000	.....	1.28	.20	
200	.....	.26	.....	
300	.....	.30	.....	
400	.....	.33	.....	
500	.....	.37	.....	
600	.....	.40	.....	
700	.....	.46	.....	
800	.....	.49	.....	
900	.....	.52	.....	
1,000	.....	.56	.....	
2,000	.....	.88	.....	
3,000	.....	1.10	.....	
4,000	.....	1.29	.....	
4,500	.....	1.36	.....	
5,000	.....	1.46	.....	
5,500	.....	1.56	.....	
6,000	.....	1.62	.....	
6,500	.....	1.69	.....	
7,000	.....	1.77	.....	
7,500	.....	1.83	.....	
8,000	.....	1.91	.....	
8,500	.....	1.97	.....	
9,000	.....	2.02	.....	
9,500	.....	2.09	.....	
		2.14	.....	Width of belt, 29″.43.
10,000	.....	2.19	.....	After 3 minutes.
		2.22	.....	After 6 minutes.
9,000	.....	2.19	.....	
8,000	.....	2.16	.....	
7,000	.....	2.13	.....	
6,000	.....	2.08	.....	
5,000	.....	2.00	.....	

No. 5940—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
4,000	.....	1.91	.....	
3,000	.....	1.79	.....	
2,000	.....	1.60	.....	
1,000	.....	1.24	.....	
900	.....	1.18	.....	
800	.....	1.11	.....	
700	.....	1.04	.....	
600	.....	.96	.....	
500	.....	.88	.....	
400	.....	.81	.....	
300	.....	.70	.....	
200	.....	.59	.....	
100	.....	.47	.47	
200	.....	.50	.....	
300	.....	.52	.....	
400	.....	.56	.....	
500	.....	.60	.....	
600	.....	.65	.....	
700	.....	.67	.....	
800	.....	.72	.....	
900	.....	.76	.....	
1,000	.....	.80	.....	
2,000	.....	1.12	.....	
3,000	.....	1.36	.....	
4,000	.....	1.55	.....	
5,000	.....	1.69	.....	
6,000	.....	1.82	.....	
7,000	.....	1.93	.....	
8,000	.....	2.03	.....	
9,000	.....	2.12	.....	
10,000	.....	2.21	.....	
11,000	.....	2.27	.....	
12,000	.....	2.37	.....	
13,000	.....	2.47	.....	
14,000	.....	2.58	.....	
15,000	.....	2.67	.....	
16,000	.....	2.76	.....	
17,000	.....	2.84	.....	
18,000	.....	2.93	.....	
19,000	.....	3.00	.....	
20,000	.....	3.07	.....	
21,000	.....	3.16	.....	Width, 28".86. Rubber shows crack in one place.
22,000	.....	3.24	.....	
23,000	.....	3.31	.....	
24,000	.....	3.35	.....	
25,000	.....	3.44	.....	
26,000	.....	3.52	.....	
27,000	.....	3.57	.....	
28,000	.....	3.63	.....	
29,000	.....	3.70	.....	
30,000	.....	3.76	.....	
31,000	.....	3.85	.....	
32,000	.....	3.91	.....	
33,000	.....	3.99	.....	=19.9 per cent.
33,900	2,808	.....	.....	Tensile strength.

Fractured 16¾″ from face of jaws.

No. 5957.

2″ COTTON BELTING—3-PLY.

Actual dimensions:
Length, 82″.
Width, 2″.08.
Thickness, ″.14.
Sectional area, 2.″08 by ″.14 = .291 square inch.
Total weight, 9½ ounces.
Weight per linear foot, 1.4 ounces.
Length between jaws of machine, 34″.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inches.*	
0	0	0.	0.	Width, 2″.08.
50	.....	1.16	.....	
100	.....	1.50	.....	
150	.....	1.76	.....	
200	.....	1.98	.46	
250	.....	2.19	.....	
300	.....	2.35	.....	
350	.....	2.50	.....	
400	.....	2.66	.....	
450	.....	2.78	.....	
500	.....	2.95	.80	
550	.....	3.06	.....	Width, 1″.97.
600	.....	3.20	.....	
650	.....	3.29	.....	
700	.....	3.38	.....	
750	.....	3.51	.....	
800	.....	3.62	.....	
900	.....	3.77	.....	
1,000	.....	4.03	2.00	=13.4 per cent.
1,100	3,780	.....	.....	Tensile strength.

Fractured 7″.5 from face of jaws.

No. 6213.

3½″ COTTON ("LEVIATHAN") BELTING—4-PLY.

Actual dimensions:
Length, 42″.28.
Width, 3″.60.
Thickness, ″.24.
Sectional area, 3″.60 by ″.24 = .864 square inch.
Total weight, 1 pound 8¾ ounces.
Weight per linear foot, 7 ounces.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inches.*	
0	.....	0.	0.	
50	.....	.02	.....	
100	.....	.12	.....	
150	.....	.22	.....	
200	.....	.34	.....	
250	.....	.42	.....	
300	.....	.51	.....	
400	.....	.62	.....	
500	.....	.73	.....	
600	.....	.86	.....	
700	.....	.98	.....	
800	.....	1.08	.....	
900	.....	1.18	.....	
1,000	.....	1.25	.50	
1,100	.....	1.34	.....	
1,200	.....	1.43	.....	
1,300	.....	1.51	.....	
1,400	.....	1.57	.....	
1,500	.....	1.64	.....	
1,600	.....	1.71	.....	
1,700	.....	1.80	.....	
1,800	.....	1.87	.....	
1,900	.....	1.95	.....	
2,000	.....	2.07	.98	
.....	.....	.....	.65	Set after 5 minutes.
50	.....	.72	.....	
100	.....	.79	.....	
150	.....	.86	.....	
200	.....	.91	.....	
250	.....	.97	.....	
300	.....	1.02	.....	
400	.....	1.12	.....	
500	.....	1.22	.....	
2,100	.....	2.15	.....	
2,200	.....	2.25	.....	
2,300	.....	2.33	.....	
2,400	.....	2.50	.....	
8,500	.....	2.57	.....	
2,600	.....	2.62	.....	
2,700	.....	2.68	.....	
2,800	.....	2.70	.....	
2,900	.....	2.78	.....	
3,000	.....	2.88	1.50	Immediate set.
.....	.....	.....	1.39	Set after 5 minutes.
3,200	.....	3.06	.....	
3,400	.....	3.28	.....	=16.4 per cent.
3,550	4,108	.....	.....	Tensile strength.

Fractured at middle of length.

No. 5955.

6″ Cotton Belting—4-ply.

Actual dimensions:
Length, 68″.
Width, 5″.94.
Thickness, ″.22.
Sectional area, 5″.94 by ″.22 = 1.31 square inches.
Total weight, 2 pounds 3¾ ounces.
Weight per linear foot, 6.3 ounces.
Length between jaws of machine, 36″.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inches.*	
0	.....	0.	0.	
50	.....	.53	.....	
100	.....	.94	.....	
150	.....	1.24	.....	
200	.....	1.50	.....	
250	.....	1.71	.....	
300	.....	1.92	.....	
350	.....	2.10	.....	
400	.....	2.27	.....	
450	.....	2.42	.....	
500	.....	2.58	.96	
600	.....	2.88	.....	
700	.....	3.10	.....	
800	.....	3.38	.....	
900	.....	3.53	.....	
1,000	.....	3.82	2.10	Width, 5″.68.
1,100	.....	3.97	.....	
1,200	.....	4.11	.....	
1,300	.....	4.26	.....	
1,400	.....	4.40	.....	
1,500	.....	4.58	.....	
1,600	.....	4.69	.....	
1,700	.....	4.82	.....	
1,800	.....	4.93	.....	
1,900	.....	5.02	.....	
2,000	.....	5.10	3.26	
50	.....	3.36	.....	
100	.....	3.49	.....	
150	.....	3.55	.....	
200	.....	3.64	.....	
300	.....	3.79	.....	
400	.....	3.93	.....	
500	.....	4.04	.....	
600	.....	4.15	.....	
800	.....	4.34	.....	
1,000	.....	4.51	.....	
1,400	.....	4.75	.....	
1,800	.....	5.00	.....	
2,000	.....	5.17	.....	Width, 5″.52.
2,100	.....	5.25	.....	
2,200	.....	5.39	.....	
2,300	.....	5.43	.....	
2,400	.....	5.51	.....	
2,500	.....	5.60	.....	
2,600	.....	5.72	.....	
2,700	.....	5.81	.....	
2,800	.....	5.88	.....	Rested 10 minutes.
2,900	.....	6.02	.....	
3,000	.....	6.05	.....	
3,100	.....	6.11	.....	
3,200	.....	6.16	.....	
3,300	.....	6.25	.....	
3,400	.....	6.35	.....	
3,500	.....	6.45	.....	
3,600	2,748	6.51	.....	= 21.7 per cent. Tensile strength.

Fractured near face of jaws.

No. 5956.

6″ COTTON BELTING—4-PLY.

Actual dimensions:
Length, 72″.9.
Width, 5″.97.
Thickness, ″.22.
Sectional area, 5″.97 by ″.22 = 1.31 square inches.
Total weight, 2 pounds 6¼ ounces.
Weight per linear foot, 6.3 ounces.
Length between jaws of machine, 36″.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inches.*	
0	.....	0.	0.	
50	.....	.26	.....	
100	.....	.65	.....	
150	.....	1.03	.....	
200	.....	1.30	.....	
250	.....	1.57	.....	
300	.....	1.76	.....	
400	.....	2.17	.....	
500	.....	2.47	.95	
50	.....	1.03	.....	
100	.....	1.24	.....	
150	.....	1.43	.....	
200	.....	1.66	.....	
250	.....	1.85	.....	
300	.....	1.98	.....	
400	.....	2.26	.....	
500	.....	2.49	.....	
600	.....	2.74	.....	
700	.....	2.98	.....	
800	.....	3.20	.....	
900	.....	3.47	.....	
1,000	.....	3.71	1.46	
50	.....	1.69	.....	
100	.....	1.92	.....	
150	.....	2.14	.....	
200	.....	2.30	.....	
250	.....	2.45	.....	
300	.....	2.57	.....	
400	.....	2.81	.....	
500	.....	3.00	.....	
1,100	.....	3.86	.....	
1,200	.....	4.04	.....	
1,300	.....	4.20	.....	
1,400	.....	4.36	.....	
1,500	.....	4.51	.....	
1,600	.....	4.65	.....	
1,700	.....	4.82	.....	
1,800	.....	4.91	.....	
1,900	.....	5.01	.....	
2,000	.....	5.15	3.11	
.....	.....	.....	2.81	Set after 6 minutes' rest.
50	.....	2.93	.....	
100	.....	3.11	.....	
150	.....	3.26	.....	
200	.....	3.41	.....	
250	.....	3.51	.....	
300	.....	3.63	.....	
400	.....	3.82	.....	
500	.....	3.95	.....	
2,100	.....	5.28	.....	Width, 5″.53.
2,200	.....	5.41	.....	
2,300	.....	5.49	.....	
2,400	.....	5.57	.....	
2,500	.....	5.72	.....	
2,600	.....	5.79	.....	

No. 5956—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inches.*	
2,700	.....	5.86	.....	
2,800	.....	5.95	.....	
2,900	.....	6.02	.....	
3,000	.....	6.11	.....	
3,100	.....	6.18	.....	
3,200	.....	6.26	.....	
3,300	.....	6.30	.....	
3,400	.....	6.39	.....	=21.3 per cent.
3,430	2,618	.....	.....	Tensile strength.

Fractured at jaws of machine.

No. 5953.

12″ COTTON BELTING—6-PLY.

Actual dimensions:
Length, 70″.20.
Width, 11″.94.
Thickness, ″.32.
Sectional area, 11″.94 by ″.32 = 3.82 square inches.
Total weight, 6 pounds 5½ ounces.
Weight per linear foot, 1 pound 1.3 ounces.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inches.*	
0	.....	0.	0.	
100	.....	.57	.....	
200	.....	1.02	.....	
300	.....	1.32	.....	
400	.....	1.58	.....	
500	.....	1.80	.....	
600	.....	1.99	.....	
700	.....	2.15	.....	
800	.....	2.23	.....	
900	.....	2.42	.....	
1,000	.....	2.60	.62	
1,200	.....	2.77	.....	
1,400	.....	2.95	.....	
1,600	.....	3.12	.....	
1,800	.....	3.30	.....	
2,000	.....	3.43	1.03	
2,200	.....	3.65	.....	
2,400	.....	3.78	.....	
2,600	.....	3.86	.....	
2,800	.....	3.98	.....	
3,000	.....	4.07	1.62	
.....	.....	.....	1.45	After resting 1 hour.
3,500	.....	4.30	.....	
4,000	.....	4.53	.....	
4,500	.....	4.75	.....	
5,000	.....	4.94	2.41	
6,000	.....	5.25	.....	
7,000	.....	5.62	.....	
8,000	.....	5.84	.....	
9,000	.....	6.08	.....	
10,000	.....	6.31	.....	=21 per cent.
0	.....	.....	3.99	
10,000	2,618	.....	.....	Tensile strength.

Fractured near middle of length.

No. 5954.

12″ COTTON BELTING—6-PLY.

Actual dimensions:
Length, 70″.8.
Width, 11″.95.
Thickness, ″.32.
Sectional area, 11″.95 by ″.32 = 3.82 square inches.
Total weight, 6 pounds 5¾ ounces.
Weight per linear foot, 1 pound 1.2 ounces.
Picks per inch; warp 18, filling 12.
Length between jaws of machine, 36″.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inches.*	
0	0	0.	0.	
100	.....	.20	.....	
150	.....	.43	.....	
200	.....	.65	.....	
250	.....	.86	.....	
300	.....	1.03	.....	
350	.....	1.21	.....	
400	.....	1.34	.27	
400	.....	1.37	.....	
500	.....	1.61	.....	
600	.....	1.81	.....	
700	.....	2.02	.....	
800	.....	2.16	.....	
900	.....	2.34	.....	
1,000	.....	2.48	.....	
800	.....	2.46	.....	
600	.....	2.39	.....	
400	.....	2.21	.....	
200	.....	1.83	.08	
200	.....	1.32	.....	
400	.....	1.75	.....	
600	.....	2.08	.....	
800	.....	2.35	.....	
1,000	.....	2.55	.....	
1,100	.....	2.69	.....	Width of belt, 11″.63.
1,200	.....	2.79	.....	
1,400	.....	2.97	.....	
1,600	.....	3.22	.....	
1,800	.....	3.49	.....	
2,000	.....	3.70	.....	
2,500	.....	4.04	.....	
3,000	.....	4.35	.....	
3,500	.....	4.70	.....	Width, 11″.12.
4,000	.....	4.98	.....	
4,500	.....	5.13	.....	
5,000	.....	5.38	.....	Rested under load 20 minutes.
5,000	.....	5.54	.....	
5,500	.....	5.64	.....	
6,000	.....	5.72	.....	
7,000	.....	5.95	.....	Width, 10″.74.
8,000	.....	6.30	.....	
9,000	.....	6.61	.....	
10,000	.....	6.75	.....	
		6.98	.....	Began to wet belting 5 minutes before this measurement was taken.
10,000	.....	7.21	.....	After 10 minutes.
		7.44	.....	After 15 minutes. Stopped applying water.
8,000	.....	7.43	.....	
6,000	.....	7.30	.....	
4,000	.....	7.18	.....	
2,000	.....	6.97	.....	
1,000	.....	6.72	.....	
0	.....	.....	5.80	Renewed water application.
0	.....	.....	5.31	After 5 minutes' soaking. Stopped applying water. Belting appears to be not quite thoroughly wetted.

No. 5954—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inches.*	
1,000	.....	5.89	.....	
2,000	.....	6.20	.....	
4,000	.....	6.63	.....	
6,000	.....	6.97	.....	
8,000	.....	7.22	.....	
10,000	.....	7.52	.....	
		7.65	.....	After 2 minutes.
8,000	.....	7.58	.....	
6,000	.....	7.50	.....	
4,000	.....	7.38	.....	
2,000	.....	7.18	.....	
1,000	.....	6.91	.....	
0	.....	.....	6.02	

Rested 15 hours, during which time the shrinkage of the belting took up the slack allowed it and applied a tensile stress, due the contractile force, of 650 pounds.

After resting, the test was resumed, the belting being thoroughly damp.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inches.*	
0	.....	.....	5.23	
1,000	.....	5.62	.....	
2,000	.....	5.96	.....	
4,000	.....	6.60	.....	
6,000	.....	7.06	.....	
8,000	.....	7.42	.....	
10,000	.....	7.80	.....	
8,000	.....	7.77	.....	
6,000	.....	7.68	.....	
4,000	.....	7.51	.....	
2,000	.....	7.22	.....	
1,000	.....	6.93	.....	
0	.....	.....	6.02	
1,000	.....	6.39	.....	
2,000	.....	6.67	.....	
4,000	.....	7.14	.....	
6,000	.....	7.46	.....	
8,000	.....	7.72	.....	
10,000	.....	7.97	.....	Width, 10″.16.
0	.....	.....	6.14	Belting again wetted, and after 20 minutes test resumed.
0	.....	.....	5.97	
1,000	.....	6.29	.....	
2,000	.....	6.63	.....	
4,000	.....	7.14	.....	
6,000	.....	7.46	.....	
8,000	.....	7.73	.....	
10,000	.....	8.02	.....	
11,000	.....	8.19	.....	= 27.3 per cent.
12,000	3,141	.....	.....	Tensile strength.

Fractured at face of jaws.

TABULATION OF BELTING TESTS.

LEATHER BELTING.

No. of test.	Description.	Actual dimensions.			Total weight.		Weight per linear foot.		Sectional area.	Tensile strength.			Fractured.
		Length.	Width.	Thickness.	Pounds.	Ounces.	Pounds.	Ounces.		Total.	Per square inch.	Per inch of width.	
		Inches.	*Inches.*	*Inch.*					*Sq. in.*	*Pounds.*	*Pounds.*	*Pounds.*	
5969	2″ single	60.00	1.98	.20	.....	13⅜	.....	2⅜	.396	1,998	5,045	1,091	1″ from face of jaws.
5967	6″ single	60.20	6.07	.22	2	11½	.....	8.7	1.34	3,400	2,537	560	At the scarf joint.
5968	6″ single (waterproofed)	60.11	6.08	.24	3	⅜	.....	9.6	1.46	3,240	2,219	533	Do.
5965	12″ single	60.11	12.05	.18	4	10½	.....	14.9	2.17	8,500	3,917	705	Do.
5966	12″ single	60.30	12.05	.24	6	½	1	3.2	2.89	4,500	1,557	373	Do.
5966*a*	Waterproofed	.....	.....	.....	.....	.....	.....	.....	.....	10,400	3,598	863	5″ from jaws.
5964	2″ double	60.00	2.07	.42	1	10⅝	.....	5.35	.869	3,498	4,025	1,690	At end of scarf joint within jaws of testing machine.
6214	4″ double	59.55	3.98	.33	2	9	.....	8.3	1.31	6,460	4,931	1,623	At the scarf joint.
5962	6″ double	60.18	5.91	.47	5	5½	1	1	2.78	11,980	4,309	2,027	Do.
5963	6″ double (waterproofed)	59.93	6.00	.40	5	8¾	1	0.6	2.40	12,400	5,166	2,066	Do.
5960	12″ double	59.90	11.90	.39	9	0	1	12.8	4.64	18,980	4,090	1,595	Do.
5961	12″ double (waterproofed)	60.06	11.93	.36	9	6½	1	14	4.29	18,980	4,424	1,591	4″ from joint.
5959	24″ double (waterproofed)	60.00	23.90	.47	22	8	4	8	11.23	31,000	2,760	1,297	At scarf joint.
5958	30″ double	59.90	29.95	.43	24	4	4	12.7	12.88	35,000	2,717	1,169	Do.

RUBBER BELTING.

5952	2″, 4-ply	60.17	2.02	.26	1	6	.....	4.4	.525	1,720	3,276	851	At face of jaws of machine.
5949	6″, 4-ply	60.17	6.08	.26	4	2¼	.....	13.2	1.58	5,100	3,227	839	3″ from jaws of machine.
5950	6″, 4-ply	60.12	6.13	.26	4	4	.....	13.6	1.59	6,000	3,773	979	12″ from jaws of machine.
5951	6″, 4-ply	60.17	6.05	.26	4	1½	.....	13	1.57	4,300	2,739	711	At face of jaws of machine.
5947	12″, 4-ply	60.02	12.08	.27	8	9½	1	11.4	3.26	9,900	3,037	819	10″ inside the gauged section.
5948	12″, 4-ply	60.14	12.24	.26	8	9¾	1	11.5	3.18	9,500	2,987	776	Near middle of length.
5946	2″, 6-ply	60.17	2.14	.36	1	14¼	.....	6	.770	2,390	3,104	1,116	4″ from face of jaws.
5944	6″, 6-ply	59.98	6.26	.37	5	15½	1	3.1	2.32	6,350	2,737	1,014	At face of jaws of machine.
5945	6″, 6-ply	60.08	6.27	.36	5	14¾	1	2.9	2.26	8,520	3,770	1,358	Near middle of length.
5942	12″, 6-ply	60.15	12.04	.36	11	2½	2	3.7	4.33	14,880	3,436	1,236	At face of jaws of machine.
5943	12″, 6-ply	60.17	12.16	.34	11	3½	2	3.7	4.13	15,950	3,862	1,311	At middle of length.
5941	24″, 6-ply	60.13	24.11	.41	24	8	4	14.2	9.89	23,550	2,381	977	At face of jaws of machine.
5940	30″, 6-ply	60.04	30.18	.40	30	12	6	2.3	12.07	33,900	2,808	1,123	16½″ from face of jaws.

a Did not have any joint; solid leather tested.

Tabulation of belting tests—Continued.

COTTON BELTING.

No. of test.	Description.	Actual dimensions.			Total weight.		Weight per linear foot.		Sectional area.	Tensile strength.			Fractured.
		Length.	Width.	Thickness.	Pounds.	Ounces.	Pounds.	Ounces.		Total.	Per square inch.	Per inch of width.	
		Inches.	*Inches.*	*Inch.*					*Sq. inch.*	*Pounds.*	*Pounds.*	*Pounds.*	
5957	2″, 3-ply	82.00	2.08	.14	.....	9½	.....	1.4	0.291	1,100	3,780	529	7″.5 from face of jaws.
6213	3½″, 4-ply ("Leviathan")	42.28	3.60	.24	1	8¾	.....	7	.864	3,550	4,108	986	At middle of length.
5955	6″, 4-ply	68.00	5.94	.22	2	3¾	.....	6.3	1.31	3,600	2,748	606	Near face of jaws.
5956	6″, 4-ply	72.00	5.97	.22	2	6¼	.....	6.3	1.31	3,430	2,618	574	At jaws of machine.
5955	12″, 6-ply	70.20	11.94	.32	6	5¾	1	1.3	3.82	10,000	2,618	837	Near middle of length.
5954	12″, 6-ply	70.80	11.95	.32	6	5¾	1	1.2	3.82	12,000	3,141	1,004	At jaws of machine.

LEATHER, RUBBER, AND COTTON BELTING.

LACED SAMPLES.

LEATHER, RUBBER, AND COTTON BELTING—LACED SAMPLES.

TENSION TESTS OF LACING FROM SAME SIDE OF LACE LEATHER USED IN BELTING TESTS OF LACED JOINTS.

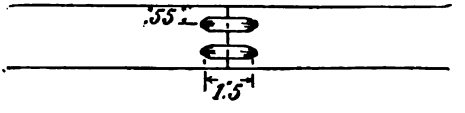
No. of test.	Dimensions.		Sectional area.	Tensile strength.		Fractured.
	Width.	Thickness.		Total.	Per square inch.	
	Inch.	*Inch.*	*Sq. in.*	*Pounds.*	*Pounds.*	
6272	.50	.06	.03	202	6,733	8″ from jaws.
6273	.50	.06	.03	208	6,933	2″ from jaws.
6274	.50	.06	.03	270	9,000	At middle of length.
6275	.50	.06	.03	274	9,133	Do.
6276	.50	.06	.03	280	9,333	1″ from jaws.
6277	.50	.06	.03	270	9,000	At jaws.
6278	.50	.06	.03	348	11,600	At middle of length.

The above seven tests were all made on the same strip of lacing, fracturing it at different places along its length.

No. 6220.

2″ SINGLE LEATHER BELTING.

Ends of sample No. 5969 used.



Laced double; lacing, $\frac{3}{8}$″ by ″.04.
Holes punched, ″.2 diameter.
Tensile strength, 392 pounds.
Fractured the lacing.

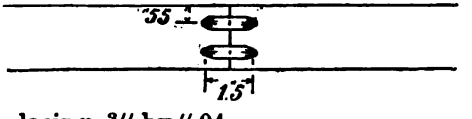
No. 6227.

Test No. 6220 repeated except lacing $\frac{1}{2}$″ wide was used.
Tensile strength, 488 pounds.
Fractured the belting, tearing at the lacing holes.

No. 6221.

2″ DOUBLE LEATHER BELTING.

Ends of sample No. 5964 used.

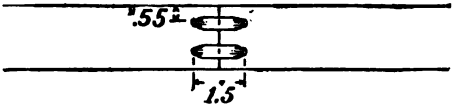


Laced double; lacing, $\frac{3}{8}$″ by ″.04.
Holes punched, ″.2 diameter.
Tensile strength, 418 pounds.
Fractured the lacing.

No. 6222.

2″ RUBBER BELTING—6-PLY.

Ends of No. 5946 used.

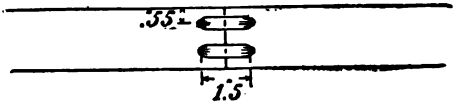


Laced double; lacing, $\frac{3}{8}$″ by ″.04.
Holes punched, ″.2 diameter.
Under 312 pounds tension lacing drew out of holes in belting without fracture.
Relaced and ends tucked through awl holes.
Tensile strength, 698 pounds.
Fractured the lacing.

No. 6223.

2″ COTTON BELTING—3-PLY.

Ends of sample No. 5957 used.

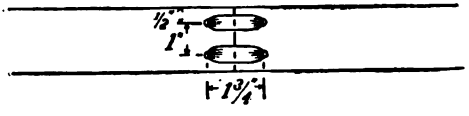


Laced double, lacing $\frac{3}{8}$″ by ″.04.
Holes punched, ″.2 diameter.
Tensile strength, 502 pounds.
Fractured belting at lacing holes and lacing fractured.

No. 6239.

2″ DOUBLE LEATHER BELTING.

Ends of sample No. 5964 used.

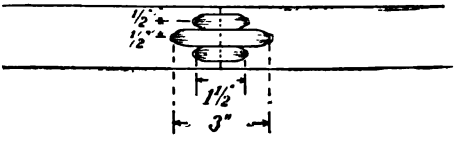


Double laced with lacing $\frac{1}{2}$″ by ″.06.
Holes punched, ″.22 diameter.
Tensile strength, 1590 pounds.
Fractured the belting across lacing holes.

No. 6228.

2″ SINGLE LEATHER BELTING.

Ends of sample No. 5969 used.

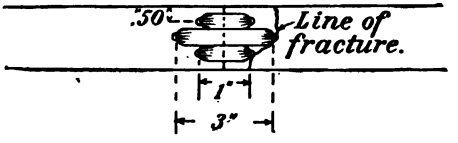


Laced double, lacing ½″ by ″.04.
Holes punched, ″.20 diameter.
Tensile strength, 840 pounds.
Fractured belting through outside single lacing hole; also developed fractures from row of inside holes to edge of belting.

No. 6235.

2″ DOUBLE LEATHER BELTING.

Ends of sample No. 5964 used.

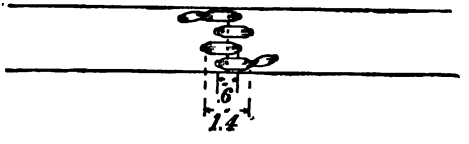


Laced double with lacing ½″ by ″.06.
Holes punched, ″.22 diameter.
Tensile strength, 1,835 pounds.
Fractured belting through two lacing holes.

No. 6287.

2″ SINGLE LEATHER BELTING.

Ends of sample No. 5969 used.



Single laced with lacing ⅜″ by ″.05.
Holes punched, ″.11 diameter.
Tensile strength, 1,050 pounds.
Fractured the belting at lacing holes.

No. 6250.

2″ SINGLE LEATHER BELTING.

Ends of sample No. 5969 used.

Hinged joint.
Holes punched, ″.15 diameter; wire hinge, ″.15 diameter.
Tensile strength, 781 pounds.
Fractured end A, having three parts, at the hinge pin holes.

No. 6251.

2″ SINGLE LEATHER BELTING.

Ends of sample No. 5969 used.
Same style of joint as No. 6250, except the ends of the belting have four parts and five parts respectively.
Holes punched, ″.12 diameter.
Wire hinge, ″.12 diameter.
Tensile strength, 772 pounds.
Fractured end of belting having five parts. The three middle sections tore out at the hinge pin holes. Wire hinge bent.

No. 6229.

2″ SINGLE LEATHER BELTING.

Ends of sample No. 5969 used.
Joint made with two belt hooks, 1″.4 from center to center of holes for hooks.
Holes punched, ″.20 diameter.
Tensile strength, 532 pounds.
Fractures started at holes in belting, and hooks straightened.
Cross-section dimensions of hooks.

No. 6230.

2″ SINGLE LEATHER BELTING.

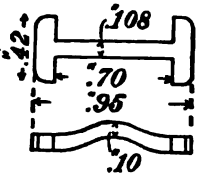
Ends of sample No. 5969 used.
Joint made with three belt hooks.
Tensile strength, 752 pounds.
Tore at holes and hooks straightened.

No. 6286 AFTER THE TEST.

No. 6285.

2″ SINGLE LEATHER BELTING.

Ends of sample No. 5969 used.
Joint made with four Blake's improved belt studs, No. 1.
Studs were used in punched slots, ″.11 wide each.



Tensile strength, 983 pounds.
Fractured the belting along line of slots.

No. 6286.

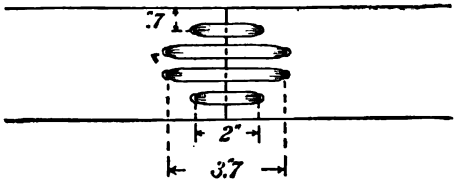
2″ SINGLE LEATHER BELTING.

Ends of sample No. 5969 used.
Joint made with four Blake's improved belt studs, No. 1.
Studs were used in slits made with a knife.
Tensile strength, 1,198 pounds.
Fractured the belting along line of slits.

No. 6224.

3½″ COTTON ("LEVIATHAN") BELTING.

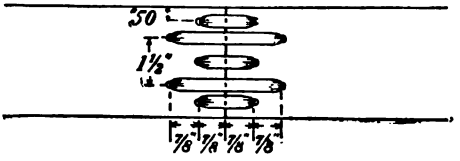
Ends of sample No. 6213 used.



Laced double; lacing, ⅜″ by ″.04.
Holes punched, ″.22 diameter.
Tensile strength, 1,020 pounds.
Fractured the lacing.

No. 6253.

$3\frac{1}{2}$″ COTTON ("LEVIATHAN") BELTING.

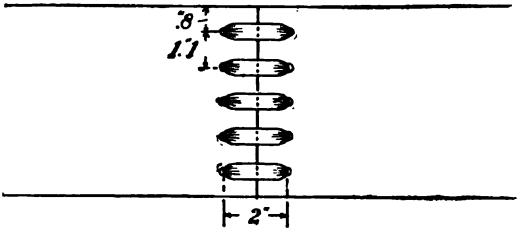


Single laced; lacing, $\frac{3}{8}$″ by ″.06.
Holes punched, ″.22 diameter.
Tensile strength, 1,414 pounds.
Fractured the lacing.

No. 6226.

6″ SINGLE LEATHER BELTING.

Ends of sample No. 5967 used.

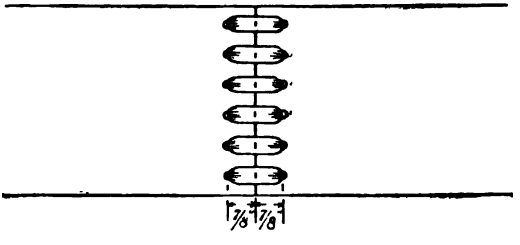


Laced double, over and under on pulley side; lacing, $\frac{1}{2}$″ by ″.04.
Holes punched, ″.22 diameter.
Tensile strength, 1,778 pounds.
Fractured belting, tearing at the lacing holes.

No. 6266.

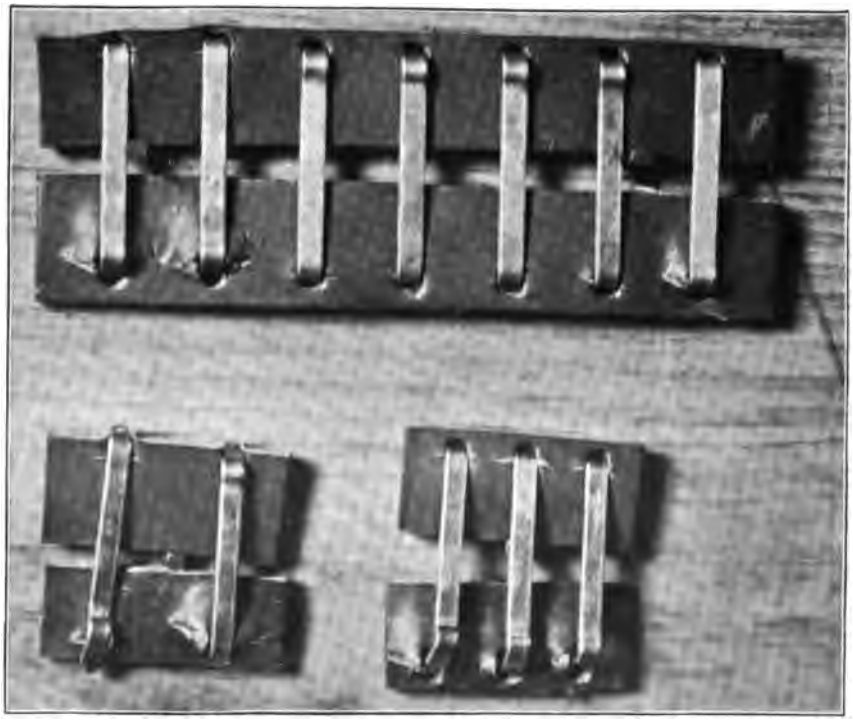
6″ SINGLE LEATHER BELTING.

Same pieces of belting used as in experiment No. 6265.



Single laced; lacing, $\frac{1}{2}$″ by ″.06.
Holes punched, ″.20 diameter.
Tensile strength, 1,980 pounds.
Fractured the belting along line of lacing holes.

Nos. 6226 AND 6232 AFTER THE TEST.

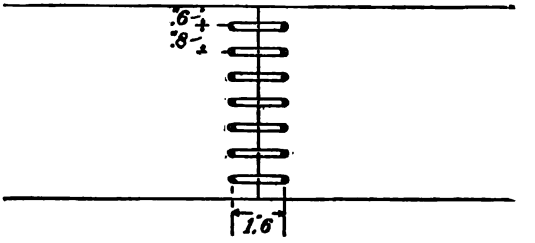


Nos. 6229, 6230, AND 6231 AFTER THE TESTS.

No. 6231.

6″ SINGLE LEATHER BELTING.

Ends of sample No. 5967 used.



Joint made with seven belt hooks, 1″.6 from center to center of holes for hooks, spaced ″.8 apart on centers, end hooks ″.6 from edges of belting.

Holes punched, ″.20 diameter.

Tensile strength, 1,890 pounds.

Fractures started at three holes in belting, and four hooks straightened without fracturing the belting.

Cross-section dimensions of hooks,

No. 6232.

6″ SINGLE LEATHER BELTING.

Ends of sample No. 5967 used.

Joint has same dimensions as No. 6231, except lacings ½″ by ″.06 used instead of belt hooks.

Laced double; punched holes, ″.20 diameter.

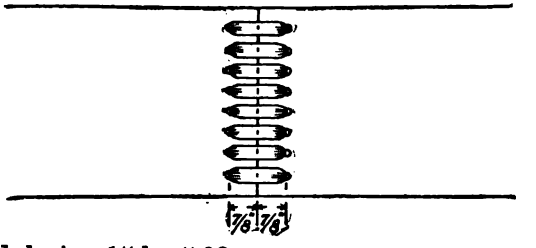
Tensile strength, 2,546 pounds.

Tore the belting at the lacing holes.

No. 6265.

6″ SINGLE LEATHER BELTING.

End of sample of 12″ belting No. 5965 used, splitting the belting into halves longitudinally.



Single laced, lacing ½″ by ″.06.

Holes punched, ″.19 diameter.

Tensile strength, 2,150 pounds.

Fractured the belting along line of lacing holes.

No. 6267.

6″ SINGLE LEATHER BELTING.

Duplicate of joint No. 6265, using the same pieces of leather, excepting in the present joint two lacings are used.

The lacing began at the middle of the belting and crossed over to the next holes with opposite inclinations, for the purpose of obtaining a joint which is balanced and without a tendency to draw the ends obliquely when loaded.

Tensile strength, 2,210 pounds.

Fractured belting along line of lacing holes, beginning at the middle of the belting.

No. 6268.

6″ SINGLE LEATHER BELTING.

Duplicate of No. 6267, excepting the center line of lacing holes is ½″ from ends of the belting.

Tensile strength, 2,100 pounds.

No. 6269.

6″ SINGLE LEATHER BELTING (waterproofed).

Same pieces of leather used as in No. 6255.

Style of joint and dimensions duplicate to No. 6268.

Tensile strength, 2,035 pounds.

Fractured belting at lacing holes. Ends of lacing not stopped securely and drew in holes.

No. 6270.

6″ SINGLE LEATHER BELTING (waterproofed).

No. 6269 repeated with ends of lacings better secured.

Same pieces of leather used as in test No. 6269.

Tensile strength, 2,110 pounds.

Fractured the belting at the lacing holes.

No. 6271.

6″ SINGLE LEATHER BELTING (waterproofed).

Same pieces of leather used as in test No. 6255.

Style of joint and dimensions same as No. 6268, excepting there are 10 lacing holes in each end of belting joined.

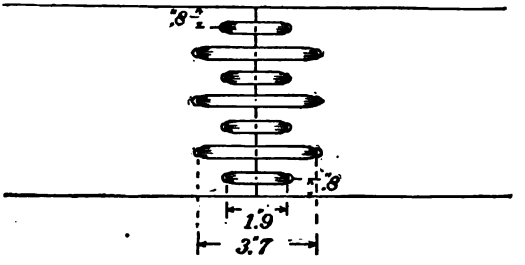
Tensile strength, 2,505 pounds.

Fractured belting along line of lacing holes.

No. 6215.

6″ SINGLE LEATHER BELTING.

Ends of sample No. 5967 used.

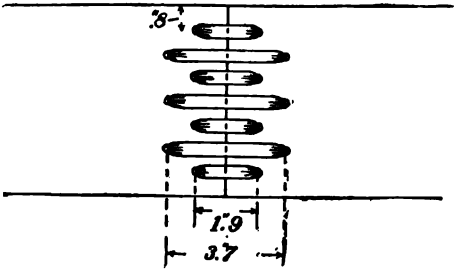


Laced double, lacing $\frac{3}{8}$″ wide by ″.04 thick.
Holes punched, ″.22 diameter.
Under 2,000 pounds tension the edges were open ″.70 and ″.60, and at the middle of the width of the belting ″.45.
Tensile strength, 2,340 pounds.
Lacing fractured into ten pieces.
Fractures were started at the sides of the lacing holes, extending into the belting about $\frac{1}{8}$″ at each side of the holes.
When first loaded the joint opened wider at the edges than at the middle of the width of the belting.

No. 6216.

6″ DOUBLE LEATHER BELTING.

Ends of sample No. 5962 used.

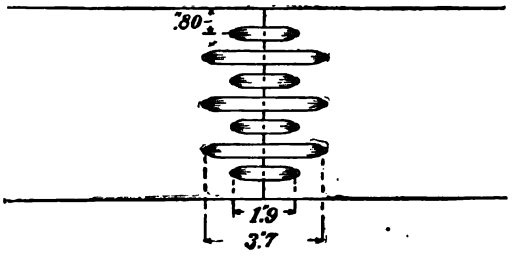


Laced double, lacing $\frac{3}{8}$″ by ″.04.
Holes punched, ″.22 diameter.
Tensile strength, 2,030 pounds.
Fractured the lacing. Holes in the belting not fractured.
When first loaded the joint opened wider at the edges than at the middle of the width of the belting.

No. 6217.

6″ RUBBER BELTING—4-PLY.

Ends of sample No. 5950 used.



Laced double, lacing ⅜″ by ″.04.
Holes punched ″.22 diameter.
Tensile strength, 2,360 pounds.
Fractured the lacing.

No. 6218.

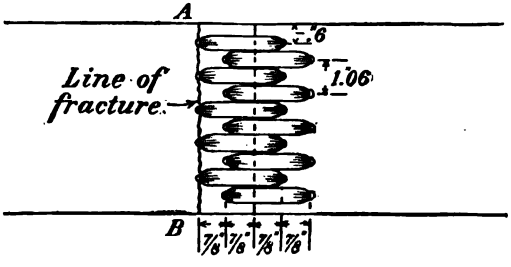
6″ RUBBER BELTING—6-PLY.

Ends of sample No. 5945 used.
Style of joint and dimensions same as No. 6217.
Tensile strength, 2,240 pounds.
Fractured the lacing.

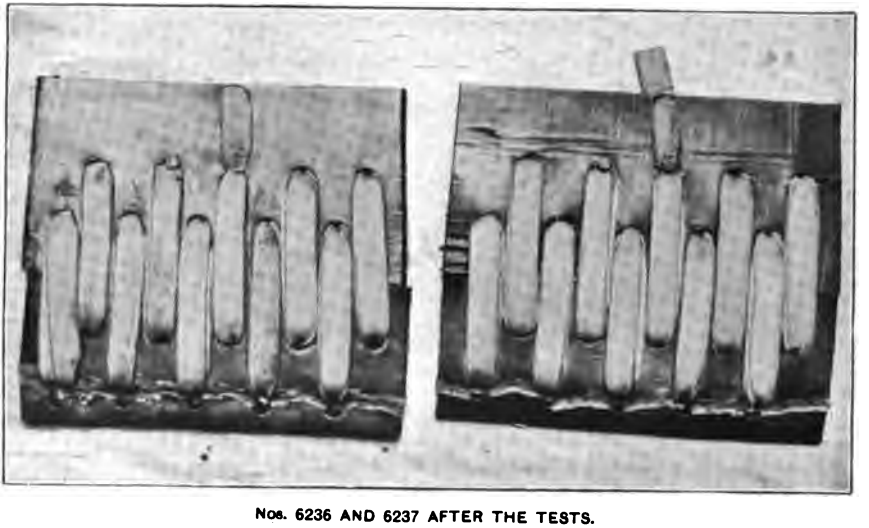
No. 6236.

6″ SINGLE LEATHER BELTING.

Ends of sample No. 5967 used.



Laced double with lacing ½″ by ″.06.
Holes punched ″.22 diameter.
Tensile strength, 3,496 pounds.
Fractured belting along outside row of lacing holes, starting at edge A.

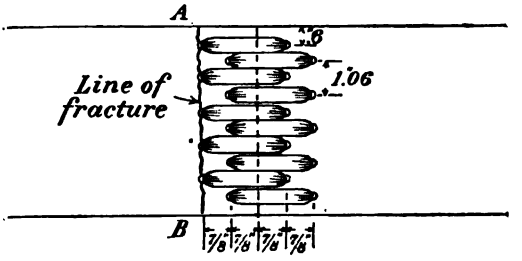


Nos. 6236 AND 6237 AFTER THE TESTS.

No. 6237.

6″ DOUBLE LEATHER BELTING.

Ends of sample No. 5962 used.



Laced double with lacing ½″ by ″.06.
Holes punched ″.22 diameter.
Tensile strength, 6,604 pounds.
Fractured belting along outside row of lacing holes, starting at edge B.

No. 6242.

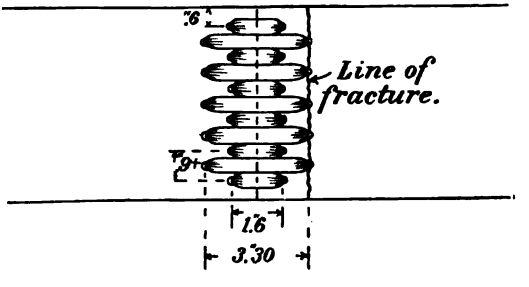
6″ DOUBLE LEATHER BELTING.

Ends of sample No. 5962 used.
Style of joint same as No. 6237, except there are 12 holes in each end.
Double-laced with lacing ⅜″ by ″.06.
Holes punched, ″.22 diameter.
Tensile strengh, 6,756 pounds.
Fractured belting across outside row of lacing holes.

No. 6233.

6″ DOUBLE LEATHER BELTING.

Ends of sample No. 5962 used.

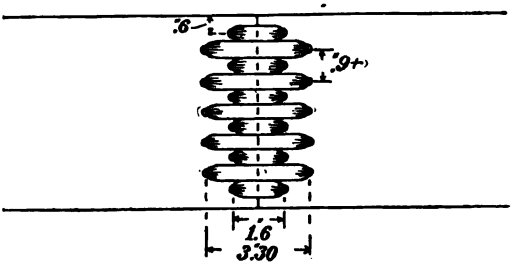


Laced double with lacing ½″ by ″.06.
Holes punched ″.22 diameter.
Tensile strength, 6,282 pounds.
Fractured the belting along outside row of lacing holes.

No. 6234.

6″ SINGLE LEATHER BELTING.

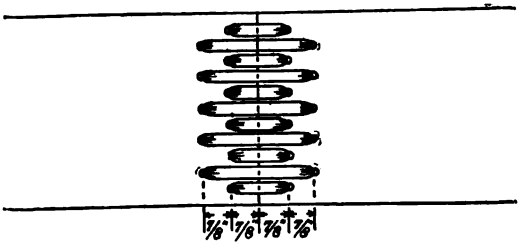
Ends of sample No. 5967 used.



Laced double with lacing ½″ by ″.06.
Holes punched ″.22 diameter.
Tensile strength, 3,412 pounds.
Fractured the belting along outside row of lacing holes.

No. 6258.

6″ RUBBER BELTING—4-PLY.

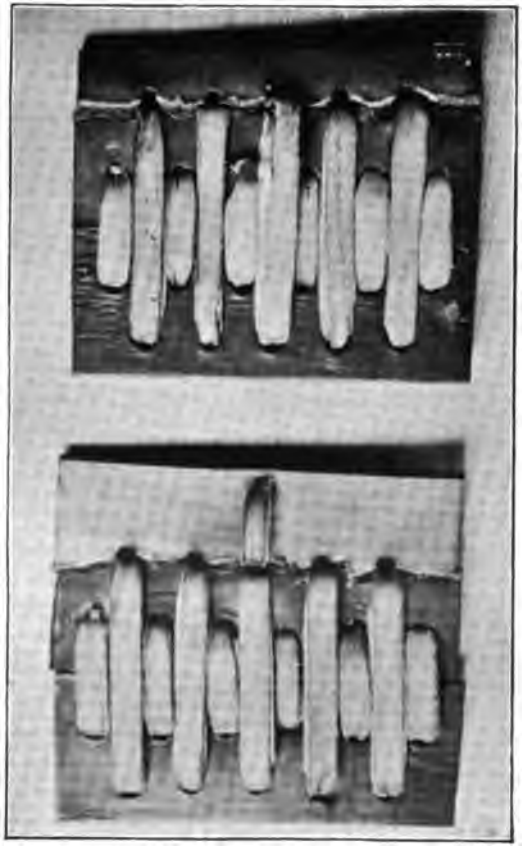


Double laced with lacing ⅜″ by ″.06.
Holes punched ″.22 diameter.
Tensile strength, 3,440 pounds.
Fractured the belting along outside row of lacing holes.

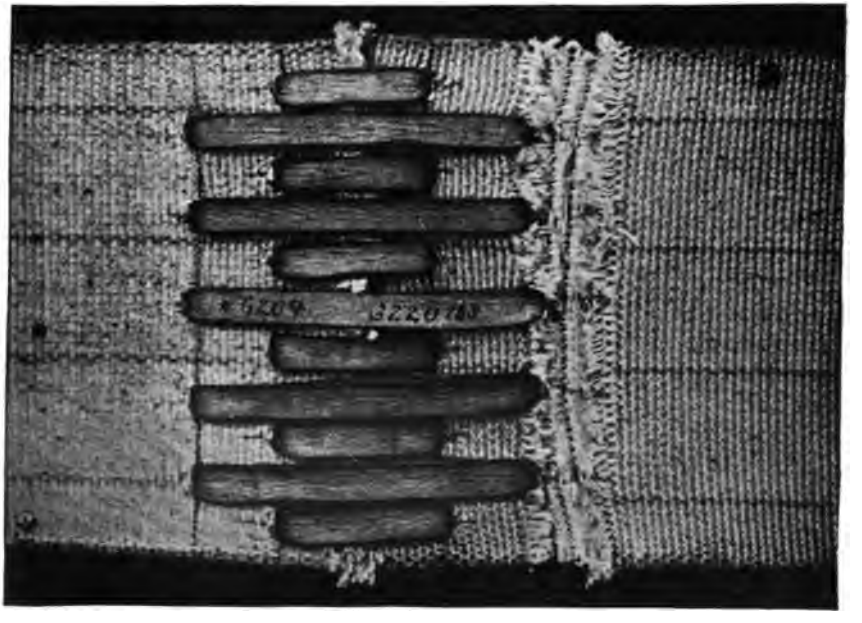
No. 6259.

6″ RUBBER BELTING—6-PLY.

Same style of lacing and dimensions as No. 6258.
Tensile strength, 3,800 pounds.
A fracture of the lacing occurred, immediately followed by the fracture of the belting; tearing apart from the edges at the outside row of lacing holes. Fractures were also started at the inside rows of lacing holes.



Nos. 6233 AND 6234 AFTER THE TESTS.

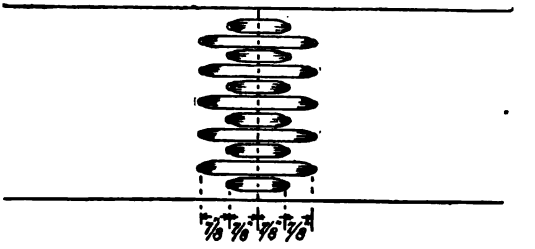


No. 6264 AFTER THE TEST.

No. 6244 AFTER THE TEST.

No. 6260.

6″ COTTON BELTING—4-PLY.



Single laced; lacing ⅜″ by ″.06.
Holes punched ″.22 diameter.
Tensile strength, 2,185 pounds.
Fractured the lacing.

No. 6264.

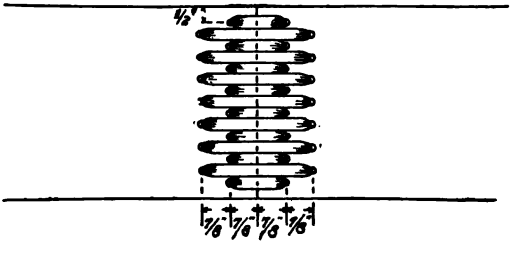
6″ COTTON BELTING—4-PLY.

Duplicate of No. 6260, using the same pieces of belting, except double laced with lacing ⅜″ by ″.06; awl holes used to lace through.
Tensile strength, 3,220 pounds.
Fractured belting along outside row of lacing holes.

No. 6244.

6″ SINGLE LEATHER BELTING.

Ends of sample No. 5967 used.



Laced single, lacing ⅜″ by ″.06.
Holes punched, ″.22 diameter.
Tensile strength, 3,280 pounds.
Fractured the lacing. The first fractures occurred next the edges of the belting.

No. 6245.

6″ SINGLE LEATHER BELTING.

Ends of sample No. 5967 used.

Same style of joint as No. 6244, except there are 8 holes in each outside row, and 9 holes in each inside row of lacing holes.

Laced single, lacing $\frac{3}{8}$″ by ″.06.

Holes punched ″.22 diameter.

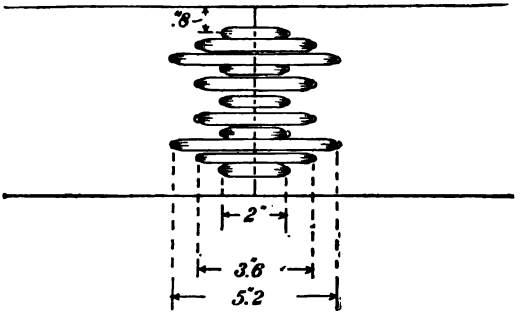
Tensile strength, 3,552 pounds.

Fractured the belting along the outside row of lacing holes.

No. 6225.

6″ SINGLE LEATHER BELTING.

Ends of sample No. 5967 used.



Laced double, lacing $\frac{1}{2}$″ by ″.04.

Holes punched ″.22 diameter.

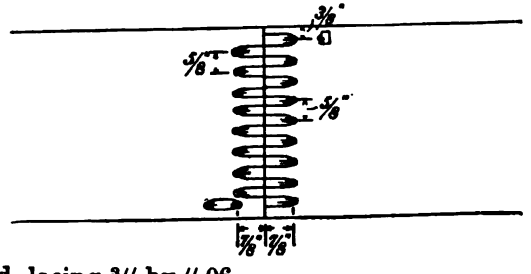
Tensile strength, 2,976 pounds.

Fractured belting, tearing at the lacing holes.

No. 6248.

6″ SINGLE LEATHER BELTING (waterproofed).

A fractured end of waterproofed 12″ single leather belting No. 5966 used; the end was cut into halves longitudinally.



Single laced, lacing $\frac{3}{8}$″ by ″.06.

Holes punched, ″.22 diameter.

Tensile strength 2,206 pounds.

Fractured the lacing. Under 2,000 pounds tension the ends of the belting were apart ″.90.

The manner of stopping the ends in this sample allowed the corners of the belting to curl as the lacings straightened.

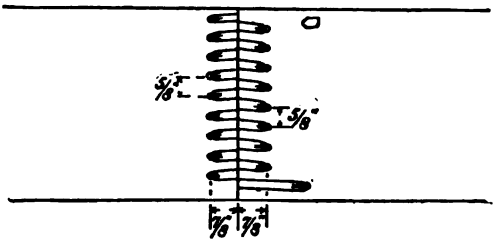
No. 6249 AFTER THE TEST.

No. 6261 AFTER THE TEST.

No. 6249.

6″ SINGLE LEATHER BELTING (waterproofed).

Ends of sample No. 5968 used.

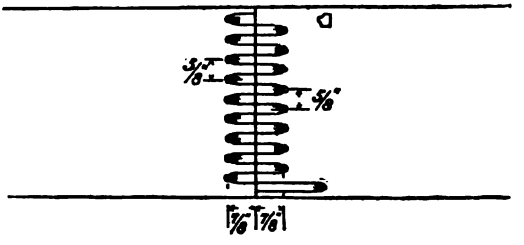


Double laced, lacing ⅜″ by ″.06.
Holes punched, ″.22 diameter.
Tensile strength, 2,860 pounds.
Fractured belting along line of lacing holes.

No. 6254.

6″ DOUBLE LEATHER BELTING.

Ends of sample No. 5962 used.



Double laced, lacing ⅜″ by ″.06.
Holes punched, ″.22 diameter.
Tensile strength, 4,490 pounds.
Fractured the lacing. Under 4,000 pounds tension one fracture of the lacing occurred.

No. 6261.

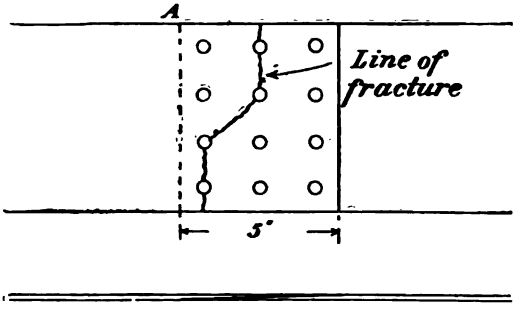
6″ DOUBLE LEATHER BELTING.

Ends of sample No. 5962 used.
Made of the same piece of belting used in No. 6254, and using the same lacing holes, but substituting a wider lacing, which was doubled.
In the present joint the lacing is ½″ wide by ″.06 thick.
Tensile strength, 6,340 pounds.
Fractured belting along line of lacing holes. Fracture began at middle of width, and on the end with eight lacing holes.

No. 6256.

6″ SINGLE LEATHER BELTING (waterproofed).

Made from fractured end of 12″ belting No. 5966, which was split lengthwise into halves.



Cemented and riveted scarf joint. Four rows of rivets, three in a row.

Tensile strength, 3,980 pounds.

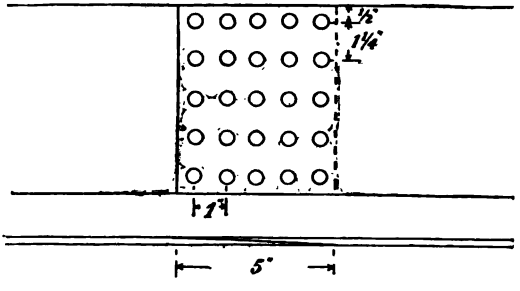
Fracture began at end of scarf, corner A, and afterwards tore the part of the belting having the grain side of the leather across two rivet holes at the middle of the scarf, and then took an oblique course to two rivet holes nearest the end of the joint, which, with the separation along the scarf, completed the fracture.

Cementing did not appear to have been fully successful.

No. 6252.

6″ SINGLE LEATHER BELTING (waterproofed).

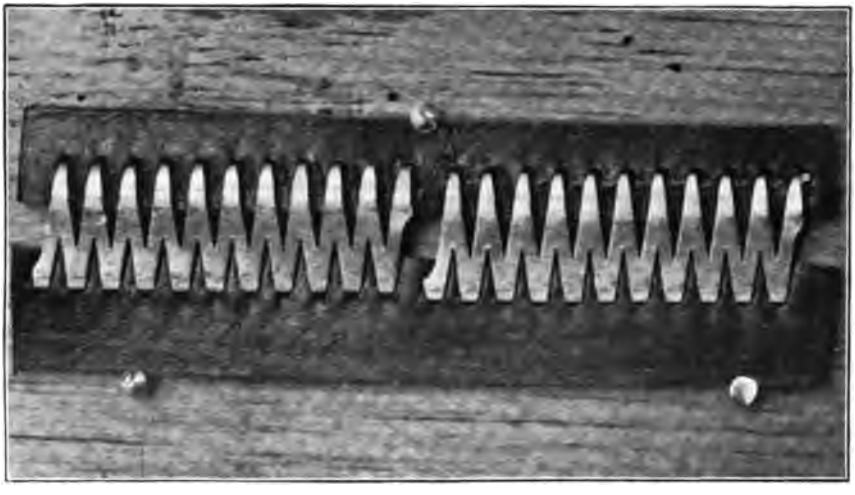
Ends of sample No. 5968 used.



Scarf joint 5″ long, riveted with 25 copper rivets. Joint not cemented.

Tensile strength, 2,104 pounds.

Fractured belting by tearing out under rivet heads and burs.



No. 6282 AFTER THE TEST.

No. 6279 AFTER THE TEST.

No. 6282.

6″ SINGLE LEATHER BELTING (waterproofed).

Made from ends of 12″ belting No. 5966.

Joint made with Bristol's patent steel belt lacing. Lacing hammered down and points clinched. There were 22 points clinched in each end of the belting.

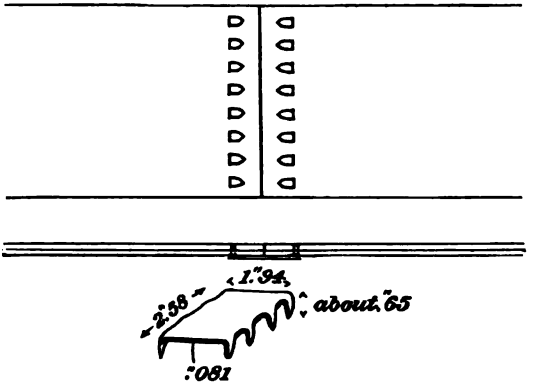
Tensile strength, 1,990 pounds.

Straightened the points of the steel lacing, the belt remaining unruptured.

No. 6279.

6″ DOUBLE LEATHER BELTING.

Ends of sample No. 5962 used.



Steel plates, eight points on each plate.

Plates with points hammered down and clinched.

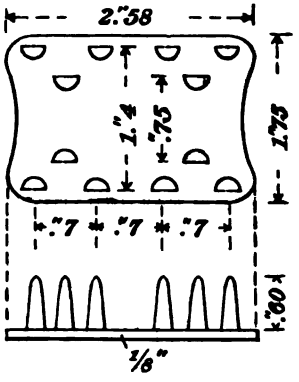
Tensile strength, 2,380 pounds.

Points of plate fractured at junction with the plate.

No. 6280.

6″ DOUBLE LEATHER BELTING.

Ends of sample No. 5962 used.
Joint made with two plates with points.

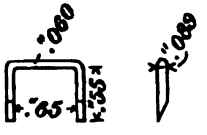


Malleable iron plates. Marks, "Pat. July 10, 83, 3 in D."
Tensile strength, 4,205 pounds.
Fractured points of plate, 12 points fracturing at junction with the plate.

No. 6284.

6″ SINGLE LEATHER BELTING (waterproofed).

Ends of sample No. 5968 used.
Joint made with 19 hooks, known as the Buffalo Belt Fastener, hammered down and points clinched.

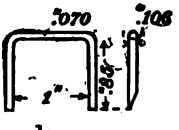


Tensile strength, 1,672 pounds.
Fasteners straightened and drew from belting.

No. 6281.

6″ DOUBLE LEATHER BELTING.

Ends of sample No. 5962 used.
Joint made with 19 wire hooks, which are known as the Buffalo Belt Fastener No. 7.



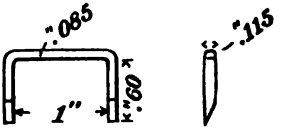
Tensile strength, 2,500 pounds.
Fasteners bent and drew out of ends of belting.

No. 6281 AFTER THE TEST.

No. 6283.

6″ SINGLE LEATHER BELTING (waterproofed).

Made from ends of 12″ belting No. 5966.
Joint made with hooks similar to but heavier than the Ruffalo Belt Fastener used in test No. 6281.
Hooks driven with hammer and clinched. Nineteen hooks used.

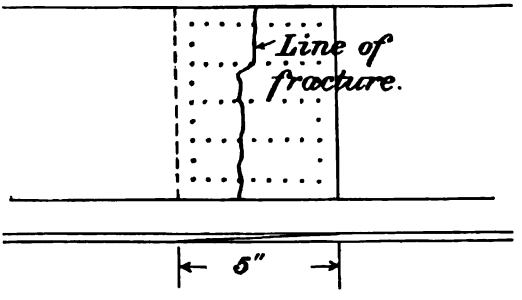


Tensile strength, 3,035 pounds.
Fractured the belting in part and straightened seven hooks.

No. 6255.

6″ SINGLE LEATHER BELTING (waterproofed).

Made from fractured end of 12″ belting No. 5966, which was split lengthwise into halves.



Cemented and pegged scarf joint. Fifty-three pegs used in all, in five rows of nine each, and pegged between rows at each end.
Tensile strength, 5,190 pounds.
Fractured one part along middle of length of scarf, and separated along scarf for the remainder of the fracture.
The part having the grain side fractured.

No. 6263.

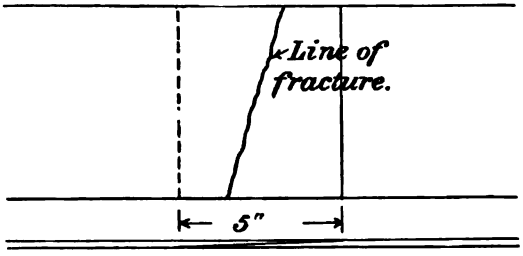
6″ SINGLE LEATHER BELTING (waterproofed).

Duplicate of No. 6255, and made of the same pieces of leather.
Tensile strength, 4,390 pounds.
Fractured at joint 1½″ from end of lap, on the grain side, then followed the scarf for remainder of fracture.

No. 6257.

6″ SINGLE LEATHER BELTING (waterproofed.)

Ends of sample No. 5968 used.



Cemented scarf joint, 5″ long.
Tensile strength, 4,710 pounds.
Fractured the part of the belting having the grain side of the leather, near middle of scarf, and then separated along the scarf.

No. 6262.

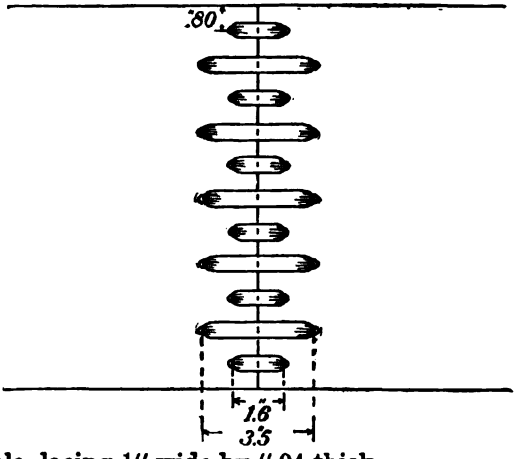
6″ SINGLE LEATHER BELTING (waterproofed).

Ends of sample No. 5968 used.
Cemented scarf joint, 5″ long.
Tensile strength, 3,640 pounds.
Separated along the scarf.

No. 6219.

12″ SINGLE LEATHER BELTING.

Ends of sample No. 5965 used.



Laced double, lacing ½″ wide by ″.04 thick.
Holes punched, ″.22 diameter.
Under 2,500 pounds tension the joint opened ″.31 and ″.37 at the edges, and ″.46 at the middle of the width of the belting.
Tensile strength, 3,180 pounds.
Fractured the belting by tearing out at the lacing holes.

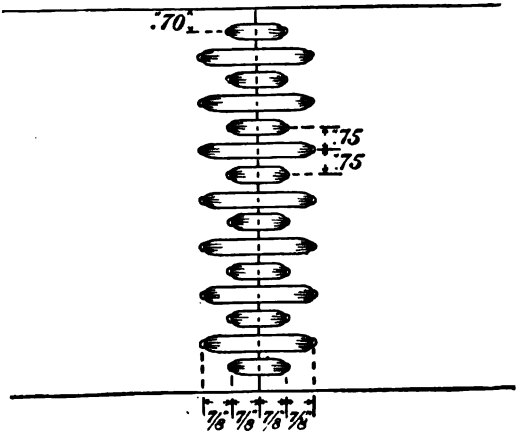
No. 6219 AFTER THE TEST.

No 6238 AFTER THE TEST.

No. 6240.

12″ SINGLE LEATHER BELTING.

Ends of sample No. 5965 used.

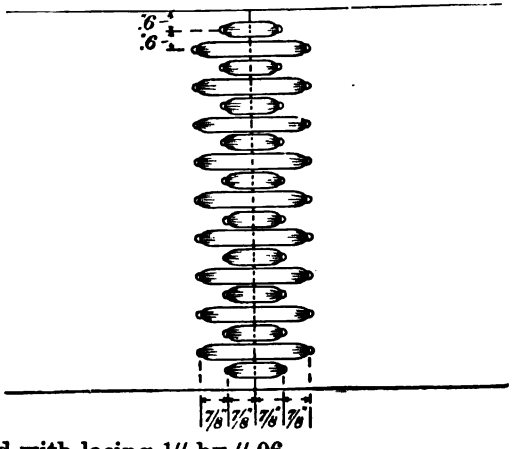


Double laced with lacing ½″ by ″.06.
Holes punched, ″.22 diameter.
Tensile strength, 4,274 pounds.
Fractured the belting along outside row of lacing holes.

No. 6238.

12″ SINGLE LEATHER BELTING.

Ends of sample No. 5965 used.
Same style of joint as No. 6219 except closer pitch of lacing holes.



Double laced with lacing ½″ by ″.06.
Holes punched, ″.22 diameter.
Tensile strength, 4,890 pounds.
Fractured belting along outside row of lacing holes, beginning at the fourth hole from the edge.

No. 6241.

12″ SINGLE LEATHER BELTING.

Ends of sample No. 5965 used.
Style of joint same as No. 6240, except there are 12 lacing holes at inside row and 11 holes in the outside row.
Holes at ends of inside rows ″.60 from edge of belting.
Double laced with lacing ⅜″ by ″.06.
Holes punched, ″.22 diameter.
Tensile strength, 5,272 pounds.
Fractured belting along outside row of lacing holes.

No. 6243.

12″ SINGLE LEATHER BELTING.

Ends of sample No. 5965 used.
Style of joint same as No. 6240, except there are 14 lacing holes at the inside rows and 13 holes in the outside rows. End holes are ″.55 from edge of belting.
Double laced with lacing ⅜″ by ″.06.
Holes punched ″.22 diameter.
Tensile strength, 5,524 pounds.
Fractured belting along outside row of lacing holes.

No. 6247.

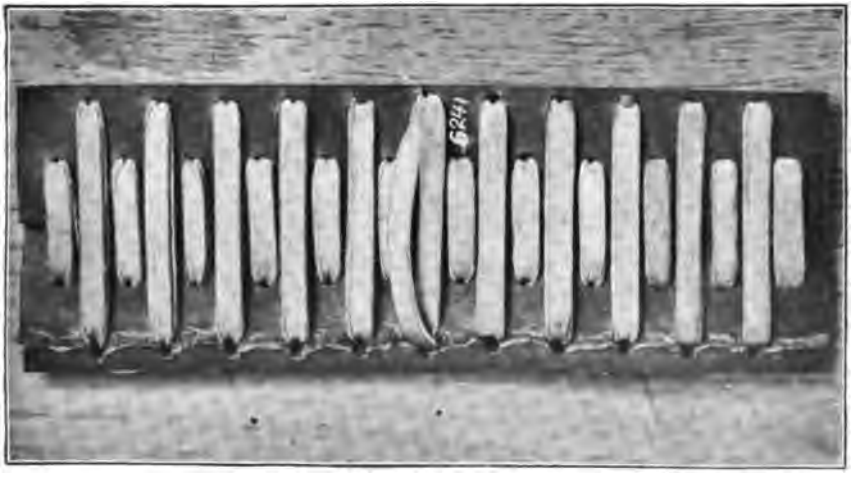
12″ SINGLE LEATHER BELTING.

Ends of sample No. 5965 used.
Same style of joint as No. 6240, except there are 16 holes in each of the outside rows and 17 holes in each of the inside rows of lacing holes.
Laced single, lacing ⅜″ by ″.06.
Holes punched ″.22 diameter.
End holes of inside rows one-half from edge of belting.
Tensile strength, 5,758 pounds.
Fractured the belting along outside row of lacing holes.

No. 6246.

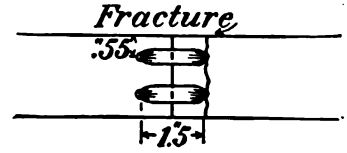
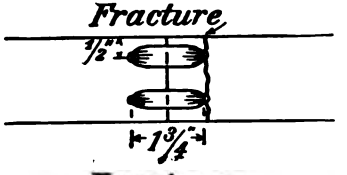
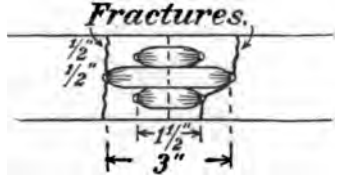
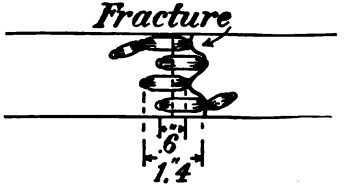
12″ SINGLE LEATHER BELTING.

Ends of sample No. 5965 used.
Same style of joint as No. 6240, except there are 18 holes in each outside row and 19 holes in each inside row of lacing holes.
Laced single, lacing ⅜″ by ″.06.
Holes punched ″.22 diameter.
End holes ½″ from edge of belting at inside rows.
Tensile strength, 6,054 pounds.
Fractured the belting along the outside row of lacing holes.

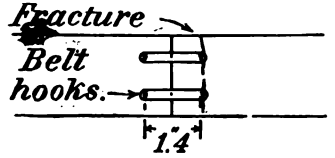
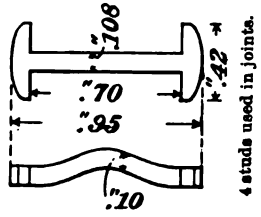


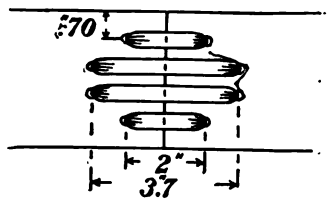
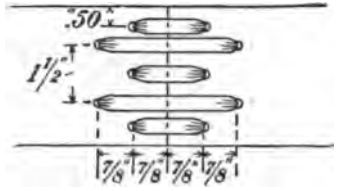
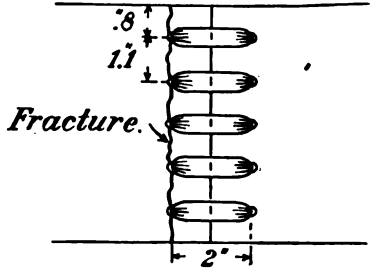
No 6241 AFTER THE TEST.

TABULATION OF LACED SAMPLES OF BELTING.

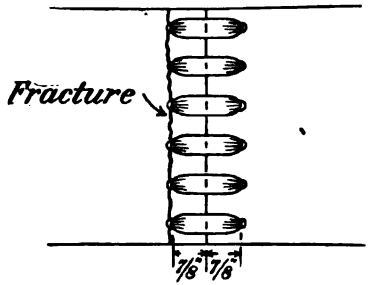
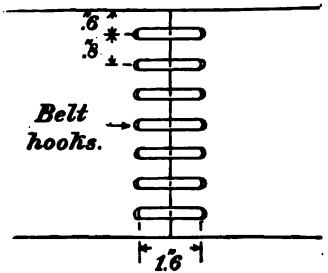
No. of test.	Description.	Style of joint.	Dimensions of lacing.		Double or single laced.	Tensile strength.		Fractured.
			Width.	Thickness.		Total.	Per inch of width.	
			Inch.	*Inch.*		*Pounds.*	*Pounds.*	
6220	2-inch single leather....		¾	.04	Double .	392	196	Lacing.
6227	.....do		¾	.04	....do ...	488	246	Belting, tearing at lacing holes.
6221	2-inch double leather ...		¾	.04	....do ...	418	202	Lacing.
6222	2-inch rubber, 6 ply.....		¾	.04	....do ...	698	326	Do.
6223	2-inch coton, 3 ply.....		¾	.04	....do ...	502	241	Lacing and belting at lacing holes.
6239	2-inch double leather ...		½	.06	....do ...	1,590	768	Belting across lacing holes.
6228	2-inch single lea...er....		½	.04	....do ...	840	424	Belting through outside single-lacing hole.
6235	2-inch double leather ...		½	.06	....do ...	1,835	886	Belting through two lacing holes.
6287	2-inch single leather....		¾	.05	Single ..	1,050	530	Belting at lacing holes.

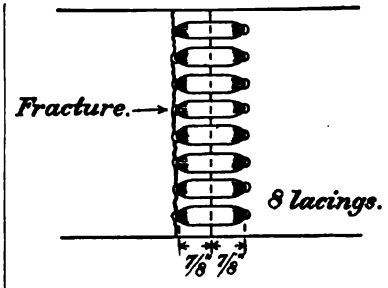
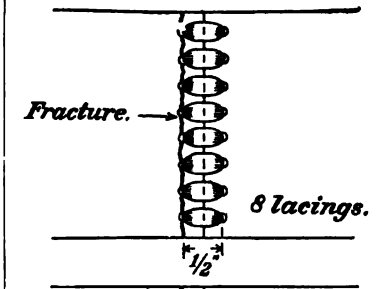
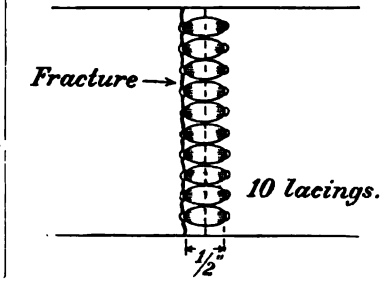
Tabulation of laced samples of belting—Continued.

No. of test.	Description.	Style of joint.	Dimensions of lacing.		Double or single laced.	Tensile strength.		Fractured.
			Width.	Thickness.		Total.	Per inch of width.	
			Inch.	*Inch.*		*Pounds.*	*Pounds.*	
6250	2-inch single leather....		.....	.....	.....	781	394	End A having three parts at the hinge-pin holes.
6251	.....do	Same as No. 6250, except the ends of belting have 4 parts and 5 parts respectively.	.....	.....	.....	772	390	End of belting having five parts.
6229	.....do		.2	.09	.....	532	269	Fracture started at holes in belting, and hooks straightened.
6230	.....do	Joint made with three belt hooks.....	.2	.09	.....	752	380	Tore at holes and hooks straightened.
6285	.....do		.....	.....	.....	983	496	Belting along line of slits.
6286	.....do		.....	.....	.....	1,198	605	Do.

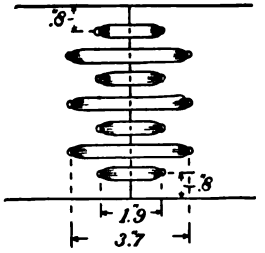
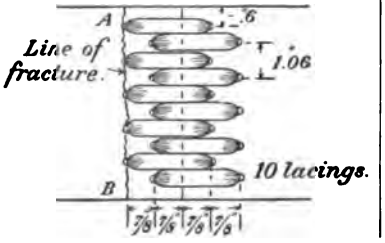
6224	3½-inch cotton ("Leviathan").		¼	.04	Double	1,020	283	Lacing.
6253	.....do		¼	.06	Single ..	1,414	393	Do.
6226	6-inch single leather....		¼	.04	Double .	1,778	293	Belting tearing at holes.

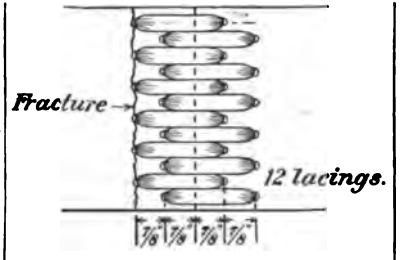
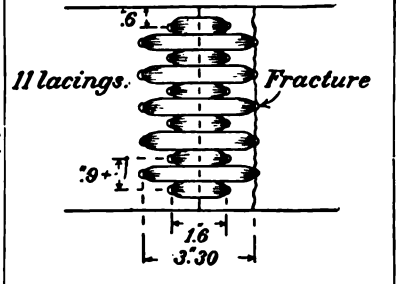
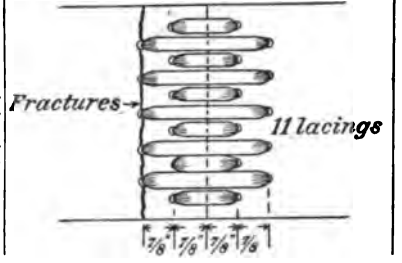
Tabulation of laced samples of belting—Continued.

No. of test.	Description.	Style of joint.	Dimensions of lacing.		Double or single laced.	Tensile strength.		Fractured.
			Width.	Thickness.		Total.	Per inch of width.	
			Inch.	*Inch.*		*Pounds.*	*Pounds.*	
6266	6-inch single leather....		½	.06	Single ..	1,980	330	Belting along line of lacing holes.
6231	.....do		.2	.09	.....	1,890	311	Fractures started at three holes in belting, and four hooks straightened without fracturing belting.
6232	.....do	Same as No. 6231, except lacing used instead of belt hooks.	½	.06	.....	2,546	419	Tore belting at lacing holes.

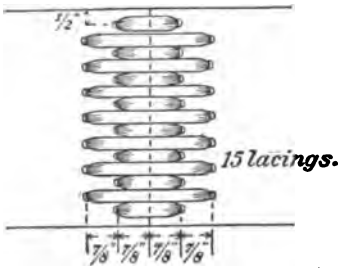
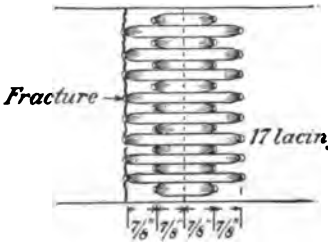
6265	.....do		¼	.06	Single ..	2,150	358	Belting along line of lacing holes.
6267	.....do		¼	.06	....do ...	2,210	368	Do.
6268	.....do		¼	.06	....do ...	2,100	350	
6269	6-inch single leather (waterproofed).		¼	.06	....do ...	2,035	339	Belting at lacing holes.
6270	.....do		¼	.06	....do ...	2,110	352	Do.
6271	.....do		¼	.06	....do ...	2,505	417	Belting along line of lacing holes.

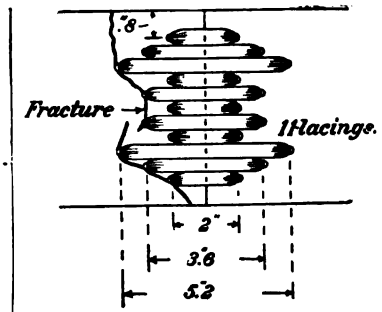
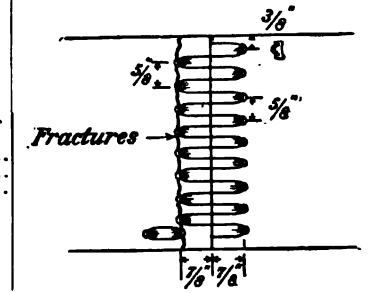
Tabulation of laced samples of belting—Continued.

No. of test.	Description	Style of joint.	Dimensions of lacing.		Double or single laced.	Tensile strength.		Fractured.
			Width.	Thickness.		Total.	Per inch of width.	
			Inch.	*Inch.*		*Pounds.*	*Pounds.*	
6215	6-inch single leather....			.04	Double .	2,340	385	Lacing. Fractures started at holes.
6216	6-inch double leather....			.04	....do ...	2,030	343	Lacing.
6217	6-inch rubber, 4-ply.....			.04	....do ...	2,360	385	Do.
6218	6-inch rubber, 6-ply.....			.04	....do ...	2,240	357	Do.
6236	6-inch single leather....		½	.06	....do ...	3,496	576	Belting along outside row of lacing holes, starting at edge A.
6237	6-inch double leather....		½	.06	....do ...	6,604	1,117	Belting along outside row of lacing holes, starting at edge B.

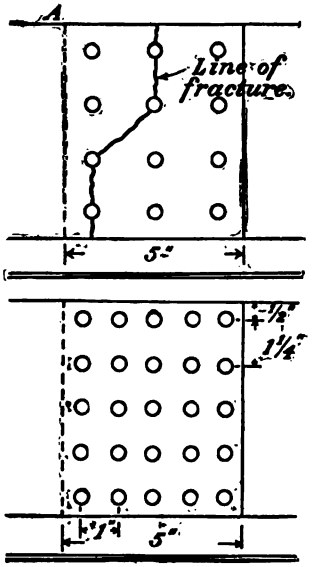
6242	....do		⅛	.06	....do ...	6,756	1,143	Belting along outside row of lacing holes.
6233	....do		⅛	.06	....do ...	6,282	1 063	Do.
6234	6-inch single leather....		⅛	.06	....do ...	3,412	562	Do.
6258	6-inch rubber, 4-ply.....		⅛	.06	....do ...	3,440	561	Do.
6259	6-inch rubber, 6-ply.....		⅛	.06	....do ...	3,800	606	Lacing and belting along outside row of lacing holes.
6260	6-inch cotton, 4-ply.....		⅛	.06	Single ..	2,185	368	Lacing.
6264	....do		⅛	.06	Double .	3,220	542	Belting along outside row of lacing holes.

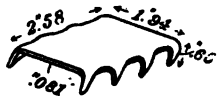
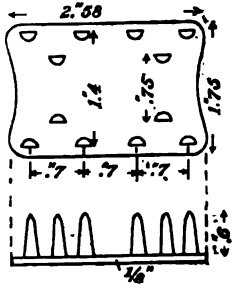
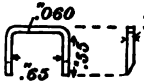
Tabulation of laced samples of belting—Continued.

No. of test.	Description.	Style of joint.	Dimensions of lacing.		Double or single laced.	Tensile strength.		Fractured.
			Width.	Thickness.		Total.	Per inch of width.	
			Inch.	*Inch.*		*Pounds.*	*Pounds.*	
6244	6-inch single leather		⅜	.06	Single ..	3,280	540	Lacing.
6245	.....do		⅜	.06	....do ...	3,552	585	Belting along outside row of lacing holes.

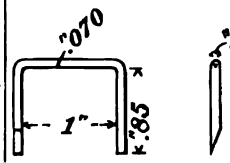
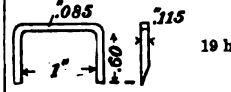
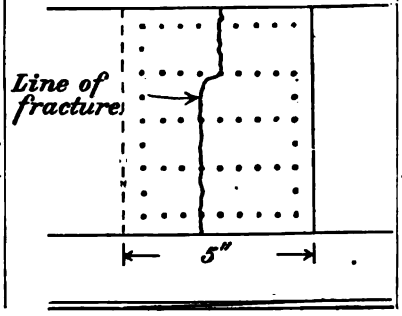
6225	.....do.....		½	.04	Double .	2,976	490	Belting tearing at lacing holes.
6248	6-inch single leather (waterproofed).		½	.06	Single ..	2,206	368	Lacing.
6249	.....do.....		½	.06	Double..	2,860	470	Belting along line of lacing holes.
6254	6-inch double leather...		½	.06	.....do ...	4,499	760	Lacing.
6261	.....do.....		½	.06	.....do ...	6,340	1,073	Belting along line of lacing holes.

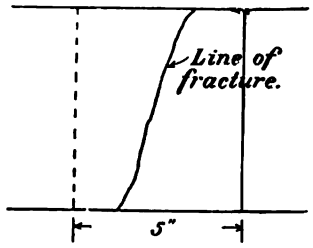
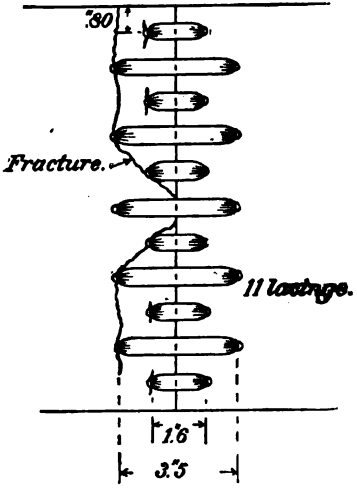
Tabulation of laced samples of belting—Continued.

No. of test.	Description.	Style of joint.	Dimensions of lacing.		Double or single laced.	Tensile strength.		Fractured.
			Width.	Thickness.		Total.	Per inch of width.	
			Inch.	*Inch.*		*Pounds.*	*Pounds.*	
6256	6-inch single leather (waterproofed).		Cemented and riveted.		.....	3,960	663	Tore belting having grain side of the leather.
6252	.....do		Riveted but not cemented.		.....	2,104	346	Belting tearing out under rivet heads and burs.

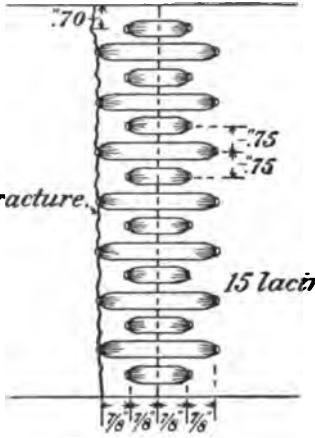
6282	.....do		22 points clinched in each end of the belting.	.....	.....	.....	1,990	332 Straightened the points of the steel lacing.
6279	6-inch double leather...		8 points in each end of belting hammered down and clinched.	.....	.....	.....	2,380	403 Points of plate at junction with the plate.
6280	.....do		12 points in each end of belting.	.....	.....	.....	4,205	711 Twelve points at junction with the plate.
6284	6-inch single leather (waterproofed).		19 hooks in joint.	.....	.....	.....	1,672	275 Fasteners straightened and drew from belting.

Tabulation of laced samples of belting—Continued.

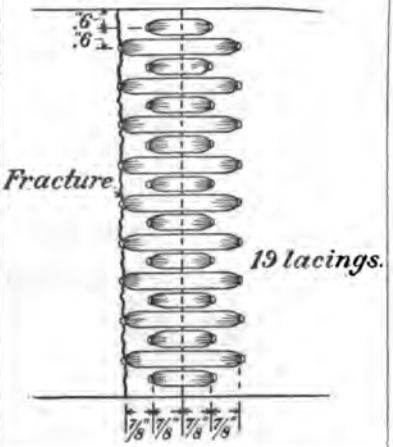
No. of test.	Description.	Style of joint.	Dimensions of lacing.		Double or single laced.	Tensile strength.		Fractured.
			Width.	Thickness.		Total.	Per inch of width.	
			Inch.	*Inch.*		*Pounds.*	*Pounds.*	
6281	6-inch double leather...	 19 hooks in joint.	.....	.....	.....	2,500	423	Fasteners straightened and drew from belting.
6283	6-inch single leather (waterproofed).	 19 hooks in joint.	.....	.....	.....	3,035	506	Belting in part and straightened 7 hooks.
6255	.....do		Cemented and pegged.		.....	5,190	865	Belting having grain side.
6263	.....do		.....do.....		.....	4,390	732	Do.

6257	.....do.....		Cemented joint.....			4,710	775	Belting having grain side of the leather.
6262	.....do.....		.....do.....			3,640	599	Separated along the scarf.
6219	12-inch single leather...		½	.04	Double.	3,180	263	Belting tearing at lacing holes.

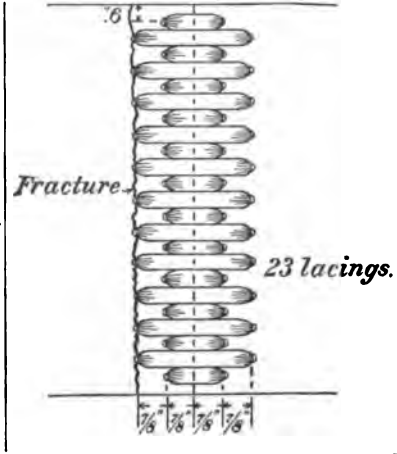
Tabulation of laced samples of belting—Continued.

No. of test.	Description.	Style of joint.	Dimensions of lacing.		Double or single laced.	Tensile strength.		Fractured.
			Width.	Thickness.		Total.	Per inch of width.	
			Inch.	*Inch.*		*Pounds.*	*Pounds.*	
6240	12-inch single leather...		¼	.06	Double..	4,274	354	Belting along outside row of lacing holes.

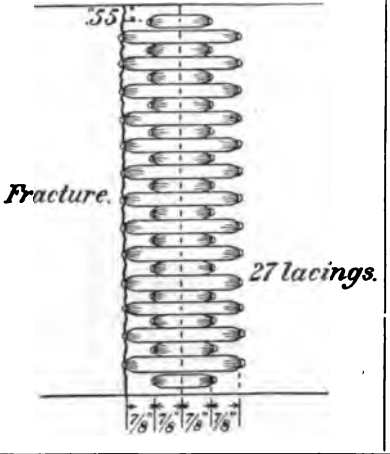
Tabulation of laced samples of belting—Continued.

No. of test.	Description.	Style of joint.	Dimensions of lacing.		Double or single laced.	Tensile strength.		Fractured.
			Width.	Thickness.		Total.	Per inch of width.	
			Inch.	*Inch.*		*Pounds.*	*Pounds.*	
6238	12-inch single leather...		½	.06	Double..	4,890	405	Belting along outside row of lacing holes, beginning at the fourth hole from the edge.

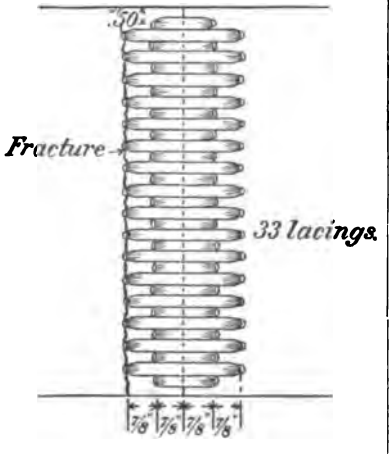
Tabulation of laced samples of belting.—Continued.

No. of test.	Description.	Style of joint.	Dimensions of lacing.		Double or single laced.	Tensile strength.		Fractured.
			Width.	Thickness.		Total.	Per inch of width.	
			Inch.	*Inch.*		*Pounds.*	*Pounds.*	
6241	12-inch single leather...		⅜	.06	Double..	5,272	438	Belting along outside row of lacing holes.

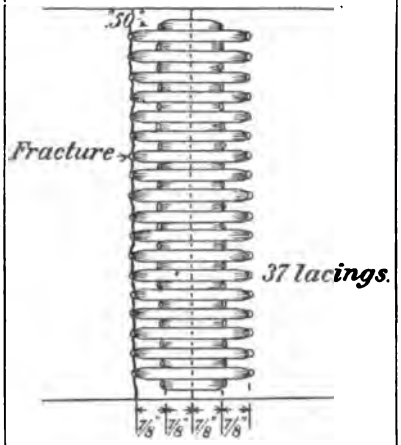
Tabulation of laced samples of belting—Continued.

No. of test.	Description.	Style of joint.	Dimensions of lacing.		Double or single laced.	Tensile strength.		Fractured.
			Width.	Thickness.		Total.	Per inch of width.	
			Inch.	*Inch.*		*Pounds.*	*Pounds.*	
6243	12-inch single leathor...		⅜	.06	Double..	5,524	458	Belting along outside row of lacing holes,

Tabulation of laced samples of belting—Continued.

No. of test.	Description.	Style of joint.	Dimensions of lacing.		Double or single laced.	Tensile strength.		Fractured.
			Width.	Thickness.		Total.	Per inch of width.	
			Inch.	*Inch.*		*Pounds.*	*Pounds.*	
6247	12-inch single leather...		⅜	.06	Single..	5,758	478	Belting along outside row of lacing holes.

Tabulation of laced samples of belting—Continued.

No. of test.	Description.	Style of joint.	Dimensions of lacing.		Double or single laced.	Tensile strength.		Fractured.
			Width.	Thickness.		Total.	Per inch of width.	
			Inch.	*Inch.*		*Pounds.*	*Pounds.*	
6246	12-inch single leather...		⅝	.06	Single...	6,054	502	Belting along outside row of lacing holes.

CORDAGE.

HEMP AND MANILA.

HEMP AND MANILA CORDAGE.

MANUFACTURED BY THE SEWALL & DAY CORDAGE COMPANY.

Samples prepared with eye splices in the ends to secure them to pins held in the jaws of the testing machine.

No. 6001.

4″ HEMP ROPE.

Actual circumference, $4\frac{1}{8}$″.
Four strands of 29 threads each.
Lay, one turn in $3\frac{1}{8}$″.
Total length, 223″.
Length between eye splices, 3 feet.
Weight, 11 pounds; weight per fathom, 3.5 pounds.
Tensile strength, 8,520 pounds = 73.4 pounds per thread.
Parted one strand at the splice.

No. 6002.

6″ HEMP ROPE.

Actual circumference, $6\frac{1}{4}$″.
Four strands of 70 threads each.
Lay, one turn in $4\frac{1}{2}$″.
Total length, 222″.
Length between eye splices, 3 feet.
Weight, $26\frac{3}{4}$ pounds; weight per fathom, 8.7 pounds.
Tensile strength, 16,500 pounds=59 pounds per thread.
Parted one strand at the splice.

No. 6003.

4″ MANILA ROPE.

Actual circumference, $4\frac{3}{8}$″.
Three strands of 41 threads each.
Lay, one turn in $3\frac{5}{8}$″.
Total length, 203″.
Length between eye splices, 2 feet.
Weight, $8\frac{1}{2}$ pounds; weight per fathom, 3 pounds.
Splices thoroughly wetted before testing.
Tensile strength, 16,890 pounds=137 pounds per thread.
Parted one strand at the splice.

No. 6004.

6″ MANILA ROPE.

Actual circumference, $6\frac{3}{8}$″.
Three strands of 89 threads each.
Lay, one turn in 5″.
Total length, 219″.
Length between eye splices, 30″.
Weight, 19 pounds; weight per fathom, 6.2 pounds.
Splices thoroughly wetted before testing.
Tensile strength, 28,700 pounds=107.5 pounds per thread.
Parted one strand at the splice.

No. 5999.

6″ MANILA HAWSER.

Actual circumference, $6\frac{3}{4}$″.
Three strands, each strand composed of a 3-stranded rope. The ropes have 28 threads in each of their strands. Total number of threads in hawser, 252.
Lay, one turn in 6″.
Total length, $246\frac{1}{2}$″.
Gauged length, 3 feet.
Weight, $24\frac{3}{4}$ pounds; weight per fathom, 7.2 pounds.
Ends secured to $4\frac{3}{8}$″ pins by means of anchor knots.

Applied loads.	In gauged length.		Remarks.
	Elongation.	Set.	
Pounds.	*Inches.*	*Inches.*	
0	0.	0.	
200	1.32	.....	
400	1.82	.....	
600	2.13	.....	
800	2.40	.....	
1,000	2.61	.....	Remained under load one-half hour.
1,200	2.94	.....	
1,400	3.10	.....	
1,600	3.30	.....	
1,800	3.50	.....	
2,000	3.59-	2.20	
.....	.....	2.12	Set after one-half minute.
2,500	4.00	.....	
3,000	4.28	.....	
3,500	4.60	.....	
4,000	4.91	2.88	
4,500	5.23	.....	
5,000	5.50	.....	
5,500	5.76	.....	
6,000	5.95	.....	
7,000	6.39	.....	
8,000	6.90	.....	
9,000	7.33	.....	
10,000	7.78	.....	
11,000	8.00	.....	
12,000	8.41	.....	
13,000	8.73	.....	
14,000	9.02	.....	Elongation = 25.1 per cent.
14,980	.....	.....	Tensile strength = 59 pounds per thread.

Parted one strand at the hitch.

No. 5923.

8″ MANILA ROPE.

Actual circumference, 9″.45.
Three strands, 155 threads per strand.
Lay, one turn in 7″.
Total length, 242½″.
Length between eye splices, 8 feet.
Gauged length, 6 feet.
Weight, 43 pounds; weight per fathom, 12.7 pounds.

Applied loads.	In gauged length.			Remarks.
	Elongation.	Successive elongation.	Set.	
Pounds.	*Inches.*	*Inches.*	*Inches.*	
0	0.	.....	0.	Circumference, 9″.45.
1,000	4.12	.....	.....	
2,000	5.41	.....	.....	
3,000	6.18	.....	.....	
4,000	6.80	.....	.....	Circumference, 8″.12.
5,000	7.33	.....	.....	
6,000	7.82	.....	.....	
7,000	8.15	.....	.....	
8,000	8.50	.....	.....	
9,000	8.85	.....	.....	
10,000	9.22	.....	5.40	Circumference, 7″.75.
11,000	9.63	.....	.....	
12,000	9.84	.....	.....	
13,000	10.08	.....	.....	
14,000	10.38	.....	.....	
15,000	10.62	.....	.....	
16,000	10.88	.....	.....	
17,000	11.05	.....	.....	
18,000	11.29	.....	.....	
19,000	11.50	.....	.....	
20,000	11.76	.....	6.96	Circumference, 7″.40.
21,000	11.95	.....	.....	
22,000	12.17	.....	.....	
23,000	12.34	.....	.....	
24,000	12.49	.....	.....	
25,000	12.62	.....	.....	
26,000	12.87	.....	.....	
27,000	13.01	.....	.....	
28,000	13.18	.....	.....	
29,000	13.27	.....	.....	
30,000	13.43	.....	.....	
25,000	13.40	.....	.....	
20,000	13.29	.....	.....	
15,000	13.16	.....	.....	
10,000	12.95	.....	.....	
5,000	12.56	.....	9.50	Removed from the testing machine and soaked in water 22 hours. Test then completed with the wet rope. The rope contracted to 5 feet 7″.45 gauged length.
— 0	—4.55	—17.11	.....	Circumference, 9″.94.
1,000	—.54	4.01	.....	
2,000	+1.68	2.22	.....	
3,000	3.42	1.74	.....	
4,000	4.71	.....	.....	
5,000	5.70	.....	.....	
6,000	6.72	.....	.....	
7,000	7.33	.....	.....	
8,000	7.85	.....	.....	
9,000	8.21	.....	.....	
10,000	8.70	.....	.....	Circumference, 8″.15.
1,000	7.34	.....	5.73	
10,000	8.87	.....	.....	
11,000	9.15	.....	.....	
12,000	9.40	.....	.....	
13,000	9.55	.....	.....	
14,000	9.80	.....	.....	
15,000	9.96	.....	.....	
16,000	10.10	.....	.....	

No. 5923—Continued.

Applied loads.	In gauged length.			Remarks.
	Elongation.	Successive elongation.	Set.	
Pounds	*Inches.*	*Inches.*	*Inches.*	
17,000	10.30	.....	.....	
18,000	10.49	.....	.....	
19,000	10.66	.....	.....	
20,000	10.82	.....	.....	Circumference, 7″.80.
21,000	11.14	.....	.....	
22,000	11.27	.....	.....	
24,000	11.43	.....	.....	
26,000	11.64	.....	.....	
28,000	11.93	.....	.....	
30,000	12.08	.....	.....	
31,000	12.22	.....	.....	
32,000	12.32	.....	.....	
33,000	12.50	.....	.....	
34,000	12.60	.....	.....	
35,000	12.68	.....	.....	
36,000	12.75	.....	.....	
37,000	12.88	.....	.....	
38,000	12.94	.....	.....	
39,000	13.00	.....	.....	
40,000	13.12	.....	.....	
41,000	13.24	.....	.....	
42,000	13.33	.....	.....	
43,000	13.42	.....	.....	
44,000	13.53	.....	.....	
45,000	13.67	.....	.....	Tensile strength = 98.4 pounds per thread. Elongation = 19 per cent.

Parted one strand at eye splice.

No. 6000.

8″ MANILA HAWSER (tarred).

Actual circumference 8″.5.

Three strands; each strand composed of a 3-stranded rope. The ropes have 36 threads in their strands, one strand of each rope having one or two threads less.

Total number of threads in hawser, 320.

Lay, one turn in 8″.

Total length, 290½″.

Gauged length, 3 feet.

Weight, 48½ pounds; weight per fathom, 12 pounds.

Ends secured by taking two round turns over 8½″ pins held against turning, and ends cross seized to standing part of hawser.

Applied loads.	In gauged length.		Remarks.
	Elongation.	Set.	
Pounds.	*Inches.*	*Inches.*	
500	1.95	.....	
1,000	2.26	.....	
1,500	2.80	.....	
2,000	3.29	.....	
2,500	3.62	.....	
3,000	3.94	.....	
3,500	4.26	.....	
4,000	4.52	.....	
4,500	4.79	.....	
5,000	5.05	2.51	
5,500	5.37	.....	
6,000	5.51	.....	
6,500	5.78	.....	
7,000	6.00	.....	
7,500	6.21	.....	
8,000	6.39	.....	
8,500	6.53	.....	
9,000	6.70	.....	
9,500	6.88	.....	
10,000	7.00	.....	
9,000	7.04	.....	
8,000	7.02	.....	
7,000	6.95	.....	
6,000	6.93	.....	
5,000	6.84	.....	
4,000	6.75	.....	
3,000	6.66	.....	
2,000	6.46	.....	
1,000	6.13	5.00	
1,000	5.32	.....	
2,000	5.63	.....	
3,000	5.87	.....	
4,000	6.13	.....	
5,000	6.39	.....	
6,000	6.60	.....	
7,000	6.72	.....	
8,000	6.87	.....	
9,000	7.02	.....	
10,000	7.25	.....	
10,500	7.36	.....	
11,000	7.47	.....	
11,500	7.65	.....	
12,000	7.86	.....	
	7.99	.....	After 2 minutes.
10,000	7.92	.....	
	7.90	.....	Do.
8,000	7.88	.....	
	7.88	.....	Do.
6,000	7.75	.....	
	7.72	.....	Do.
4,000	7.64	.....	
	7.58	.....	Do.
2,000	7.35	.....	
	7.32	.....	Do.

No. 6000—Continued.

Applied loads.	In gauged length.		Remarks.
	Elongation.	Set.	
Pounds.	*Inches.*	*Inches.*	
1,000	7.09	.....	
	7.00	.....	After 2 minutes.
0	.....	5.72	
0	.....	5.50	Do.
0	.....	5.11	After 15 hours.
1,000	5.60	.....	
	5.60	.....	After 2 minutes
2,000	5.97	.....	
	5.98	.....	Do.
4,000	6.53	.....	
	6.60	.....	Do.
6,000	6.97	.....	
	7.02	.....	Do.
8,000	7.32	.....	
	7.38	.....	Do.
10,000	7.65	.....	
	7.75	.....	Do.
12,000	7.99	.....	
	8.11	.....	Do.
13,000	.....	.....	Seizing parted. Took off cross seizing and seized ends in regular manner, with standing and running parts parallel. This seizing did not hold so well as the cross seizing. The hawser now secured with a half hitch in each end, in addition to the two round turns as used before. The ends stopped back beyond the half hitches.
13,000	8.32	.....	
15,000	8.57	.....	
17,000	9.05	.....	
20,000	9.83	.....	
21,000	10.30	.....	
22,000	10.51	.....	
23,000	10.67	.....	
24,000	10.96	.....	
25,000	11.30	.....	
26,000	11.51	.....	Elongation=32.0 per cent.
26,100	.....	.....	Tensile strength=81.6 pounds per thread.

Parted at middle of length.

No. 5922.

10″ MANILA ROPE.

Actual circumference, 11″.2.
Three strands, 237 threads per strand.
Lay, one turn in 8″.
Total length, 315″.
Length between eye splices, 138″.
Gauged length, 6 feet.
Weight, 84 pounds; weight per fathom, 19.2 pounds.

Applied loads.	In gauged length.		Remarks.
	Elongation.	Set.	
Pounds.	*Inches.*	*Inches.*	
0	0.	0.	Circumference, 11″.2.
1,000	3.57	.....	
2,000	4.97	.....	
3,000	5.90	.....	
4,000	6.53	.....	Circumference, 10″.2.
5,000	7.03	.....	
6,000	7.48	.....	
7,000	7.93	.....	
8,000	8.29	.....	
9,000	8.57	.....	
10,000	8.90	.....	Circumference, 9″.85.
	9.24	.....	After 30 minutes.
1,000	8.42	.....	
0	.....	7.11	Circumference, 10″.2.
11,000	9.42	.....	
12,000	9.63	.....	
13,000	9.86	.....	
14,000	10.03	.....	
15,000	10.35	.....	Rested 3 minutes.
16,000	10.48	.....	
17,000	10.62	.....	
18,000	10.84	.....	
19,000	11.01	.....	
20,000	11.20	.....	Circumference, 9″.85.
21,000	11.50	.....	
22,000	11.64	.....	
23,000	11.75	.....	
24,000	11.95	.....	
25,000	12.18	.....	
26,000	12.35	.....	
27,000	12.45	.....	
28,000	12.58	.....	
29,000	12.85	.....	Rested 2 minutes.
30,000	12.98	.....	Circumference, 9″.10. Rested 1 hour, the load falling in the meantime to 18,700 pounds.
19,000	12.87	.....	
20,000	12.89	.....	
21,000	12.92	.....	
22,000	12.95	.....	
23,000	12.99	.....	
24,000	13.02	.....	
25,000	13.05	.....	
26,000	13.08	.....	
27,000	13.12	.....	
28,000	13.18	.....	
29,000	13.22	.....	
30,000	13.25	.....	
31,000	13.30	.....	
32,000	13.37	.....	
33,000	13.42	.....	
34,000	13.50	.....	
35,000	13.61	.....	
36,000	13.68	.....	
37,000	13.77	.....	
38,000	13.90	.....	
39,000	14.00	.....	
40,000	14.11	.....	Circumference, 8″.85.
1,000	12.62	.....	
0	.....	11.24	

No. 5922—Continued.

Applied loads.	In gauged length.		Remarks.
	Elongation.	Set.	
Pounds.	*Inches.*	*Inches.*	
40,000	14.43	.....	
42,000	14.59	.....	
44,000	14.67	.....	
46,000	14.79	.....	
10,000	13.80	.....	Remained under load 16 hours.
20,000	14.10	.....	
30,000	14.40	.....	
40,000	14.69	.....	
46,000	15.00	.....	
48,000	15.08	.....	
50,000	15.15	.....	
52,000	15.23	.....	
54,000	15.36	.....	
56,000	15.42	.....	
58,000	15.55	.....	
60,000	15.70	.....	
62,000	15.90	.....	
64,000	16.00	.....	
66,000	16.20	.....	
68,000	16.28	.....	
70,000	16.45	.....	Elongation=22.8 per cent.
71,700	.....	.....	Tensile strength=101 pounds per thread.

Parted one strand at the eye splice.

No. 5921.

12″ MANILA ROPE.

Actual circumference, 13⅜″.
Three strands, 329 threads per strand.
Lay, one turn in 10″.
Total length, 306″.
Length between splices, 126″.
Gauged length, 6 feet.
Weight, 112 pounds; weight per fathom, 26.4 pounds.
The rope was wetted in vicinity of splices.

Applied loads.	In gauged length.			Remarks.
	Elongation.	Successive elongation.	Set.	
Pounds.	*Inches.*	*Inches.*	*Inches.*	
0	0.	0.	0.	Circumference, 13⅜″.
1,000	3.5	3.5	.....	
2,000	4.25	.75	.....	Circumference, 12″.15.
3,000	4.81	.56	.....	
4,000	5.25	.44	.....	Circumference, 11″.90.
5,000	5.62	.37	.....	
6,000	5.98	.36	.....	
7,000	6.26	.28	.....	
8,000	6.50	.24	.....	
9,000	6.71	.21	.....	
10,000	6.90	.19	.....	Circumference, 11″.70.
11,000	7.20	.30	.....	
12,000	7.40	.20	.....	
1,000	6.13	—1.27	.....	
13,000	7.54	.....	.....	
14,000	7.71	.....	.....	
15,000	8.02	.....	.....	Rested 1 minute.
16,000	8.14	.....	.....	
17,000	8.20	.....	.....	
18,000	8.34	.....	.....	
19,000	8.51	.....	.....	
20,000	8.60	.....	.....	
1,000	7.28	.....	.....	
0	.....	.....	4.72	
1,000	6.04	.....	.....	
2,000	6.33	.....	.....	
4,000	6.88	.....	.....	
6,000	7.19	.....	.....	
8,000	7.49	.....	.....	
10,000	7.75	.....	.....	
12,000	7.98	.....	.....	
14,000	8.14	.....	.....	
16,000	8.37	.....	.....	
18,000	8.56	.....	.....	
20,000	8.73 8.90	.....	.....	After 2 minutes.
21,000	8.94	.....	.....	
22,000	9.01	.....	.....	
23,000	9.10	.....	.....	
24,000	9.17	.....	.....	
25,000	9.29	.....	.....	
26,000	9.37	.....	.....	Circumference, 11″.12.
27,000	9.49	.....	.....	
28,000	9.56	.....	.....	
29,000	9.68	.....	.....	
30,000	9.79 9.87	.....	.....	After 2 minutes.
24,000	9.81	.....	.....	
20,000	9.73	.....	.....	
16,000	9.65	.....	.....	
12,000	9.48	.....	.....	
8,000	9.33	.....	.....	
4,000	8.92	.....	.....	
1,000	8.19 8.10	.....	.....	Circumference, 11″.40. After 1 minute.
4,000	8.28	.....	.....	
8,000	8.63	.....	.....	
12,000	8.88	.....	.....	

No. 5921—Continued.

Applied loads.	In gauged length.			Remarks.
	Elongation.	Successive elongation.	Set.	
Pounds.	*Inches.*	*Inches.*	*Inches.*	
16,000	9.14	.....	.....	
20,000	9.36	.....	.....	
24,000	9.55	.....	.....	
30,000	9.89	.....	.....	
31,000	9.98	.....	.....	
32,000	10.06	.....	.....	
33,000	10.12	.....	.....	
34,000	10.21	.....	.....	
35,000	10.29	.....	.....	
36,000	10.48	.....	.....	
37,000	10.55	.....	.....	
38,000	10.66	.....	.....	
39,000	10.73	.....	.....	
40,000	10.85	.....	.....	
41,000	10.93	.....	.....	
42,000	10.98	.....	.....	Circumference, 10″.60.
43,000	11.04	.....	.....	Rested 3 minutes.
44,000	11.15	.....	.....	
45,000	11.20	.....	.....	
46,000	11.24	.....	.....	
47,000	11.31	.....	.....	
48,000	11.36	.....	.....	
49,000	11.51	.....	.....	
50,000	11.58	.....	.....	
51,000	11.68	.....	.....	
52,000	11.79	.....	.....	
53,000	11.82	.....	.....	
54,000	11.91	.....	.....	
56,000	12.00	.....	.....	
58,000	12.08	.....	.....	
60,000	12.23	.....	.....	
62,000	12.34	.....	.....	
50,000	12.24	.....	.....	
40,000	12.09	.....	.....	
30,000	11.99	.....	.....	
20,000	11.79	.....	.....	
10,000	11.45	.....	.....	
2,000	10.57	.....	.....	
1,000	10.20	.....	.....	
0	.....	.....	8.50	
1,000	8.89	.....	.....	
2,000	9.20	.....	.....	
10,000	10.25	.....	.....	
20,000	10.82	.....	.....	
30,000	11.23	.....	.....	
40,000	11.61	.....	.....	
50,000	11.95	.....	.....	
60,000	12.28	.....	.....	
62,000	12.47	.....	.....	
64,000	12.60	.....	.....	
66,000	12.70	.....	.....	
68,000	12.78	.....	.....	
70,000	12.88	.....	.....	
74,000	13.10	.....	.....	Elongation = 18.2 per cent.
77,300	.....	.....	.....	Tensile strength = 78.3 pounds per thread.

Parted one strand at eye splice.

No. 5921*a*.

A new eye was spliced in the fractured end, splices thoroughly wetted, and rope again tested.

Tensile strength, 79,200 pounds=80.2 pounds per thread.

Parted one strand at middle of length.

TABULATION OF CORDAGE FROM THE SEWALL & DAY CORDAGE COMPANY.

No. of test.	Kind of rope.	Actual circumference.	Strands.	Threads per strand.	Lay, one turn in.	Weight per fathom.	Tensile strength of rope.	Tensile strength per thread.	Parted.
		Inches.			*Ins.*	*Pounds.*	*Pounds.*	*Pounds.*	
6001	4″ hemp rope...	4¼	4	29	3⅛	3.5	8,520	73.4	One strand at splice.
6002	6″ hemp rope...	6¼	4	70	4½	8.7	16,500	59	Do.
6003	4″ manila rope..	4⅛	3	41	3⅝	3	16,890	137	Do.
6004	6″ manila rope..	6⅛	3	89	5	6.2	28,700	107.5	Do.
5999	6″ manila hawser.	6⅛	3	84	6	7.2	14,980	59	One strand at hitch.
5923	8″ manila rope..	9.45	3	155	7	12.7	45,000	98.4	One strand at splice.
6000	8″ manila hawser, tarred.	8.5	3	107	8	12	26,100	81.6	At middle of length.
5922	10″ manila rope.	11.2	3	237	8	19.2	71,700	101	One strand at splice.
5921	12″ manila rope.	13⅜	3	329	10	26.4	77,300	78.3	Do.
5921*a*	.....do.....	.....	.....	.....	.....	.....	79,200	80.2	At middle of length.

TESTS OF HEMP AND MANILA CORDAGE FOR UNITED STATES LIGHT-HOUSE INSPECTOR, THIRD DISTRICT.

Samples 3 feet long each, except the 4½″ to 7″ ropes which were 6 feet long.

Secured in testing machine by eye splices at the ends.

No. of test.	Marks.	Kind of rope.	Actual circumference.	Strands.	Threads per strand.	Lay, one turn in.	Tensile strength.	Parted.
			Ins.			*Ins.*	*Pounds.*	
5792	A	6-thread manila...	3	3	2	⅞	858	One strand at splice.
5793	B	.....do	2⅞	3	2	¾	704	Two strands 4″ from splice.
5794	C	.....do	2⅞	3	2	¾	725	One strand at splice.
5795	A	9-thread manila...	1½	3	3	1	1,193	Do.
5796	B	.....do	1⅜	3	3	⅞	1,072	One strand 6″ from splice.
5797	C	.....do	1½	3	3	1	1,320	One strand at splice.
5798	A	12-thread manila..	1⅝	3	4	1	1,850	Do.
5799	B	.....do	1⅝	3	4	1⅛	1,535	One strand 2″ from splice.
5800	C	.....do	1⅝	3	4	1⅛	1,676	One strand at splice.
5801	A	15-thread manila..	1⅞	3	5	1⅛	2,010	Do.
5802	B	.....do	1⅞	3	5	1¼	1,985	Do.
5803	C	.....do	1⅞	3	5	1⅛	2,228	Do.
5804	A	18-thread manila..	1⅞	3	6	1⅛	2,492	Do.
5805	B	.....do	1⅞	3	6	1⅛	2,204	Do.
5806	C	.....do	1⅞	3	6	1⅛	2,265	Do.
5807	A	21-thread manila..	1⅞	3	7	1⅛	2,710	Do.
5808	B	.....do	1⅞	3	7	1⅛	2,715	One strand 7″ from splice.
5809	C	.....do	1⅞	3	7	1⅛	2,690	One strand at splice.

Tests of hemp and manila cordage for United States light-house inspector, third district—Continued.

No. of test.	Marks.	Kind of rope.	Actual circumference.	Strands.	Threads per strand.	Lay, one turn in.	Tensile strength.	Parted.
			Ins.			*Ins.*	*Pounds.*	
5810	A	1″ manila.....	1 3/16	3	3	1	1,298	One strand at splice.
5811	B	.....do	1 1/8	3	3	1	1,042	Do.
5812	A	1 1/4″ manila.....	1 1/8	3	7	1 3/16	2,841	One strand at middle.
5813	B	.....do	1 1/8	3	8	1 1/4	3,296	One strand 8″ from splice.
5814	A	2″ manila.....	2	3	11	2 1/16	4,248	One strand at splice.
5815	B	.....do	2 1/16	3	13	2 1/4	4,750	Do.
5816	C	.....do	2 1/16	3	10	2 1/16	4,380	One strand 6″ from splice.
5817	A	2 1/8″ manila.....	2 1/8	3	16	2 1/8	7,886	One strand at splice.
5818	B	.....do	2 1/8	3	18	2 3/8	6,980	Do.
5819	C	.....do	2 1/8	3	17	2 1/16	6,640	One strand at middle.
5820	A	3″ manila.....	3 1/8	3	22	2 1/8	10,200	One strand at splice.
5821	B	.....do	3 1/16	3	25	3	10,360	Do.
5822	C	.....do	3 1/8	3	23	2 1/16	11,065	Do.
5823	A	3 1/4″ manila.....	4	3	28	3 1/4	13,610	Do.
5824	B	.....do	4 1/16	3	29	3 1/8	12,175	Do.
5825	C	.....do	3 15/16	3	31	3 1/16	12,920	Do.
5826	A	4″ manila.....	4 1/16	3	35	3 1/8	14,920	Do.
5827	B	.....do	4 1/8	3	37	3 1/4	16,170	Do.
5828	C	.....do	4 1/8	3	40	3 1/8	14,710	Do.
5829	A	4 1/2″ manila.....	5 1/8	3	51	3 1/4	21,750	Do.
5830	B	.....do	5 1/16	3	42	3 1/16	19,140	Do.
5831	C	.....do	5 1/8	3	54	3 1/16	21,200	Do.
5832	A	5″ manila.....	6	3	62	4 1/8	27,520	Do.
5833	B	.....do	6 1/8	3	64	4 1/8	25,400	Do.
5834	C	.....do	5 1/8	3	67	4 1/16	24,520	Do.
5835	A	5 1/8″ manila.....	6 1/16	3	75	4 1/8	27,750	Do.
5836	B	.....do	6 1/8	3	62	4 1/8	31,700	Do.
5837	C	.....do	5 15/16	3	62	4	27,250	Do.
5838	A	6″ manila.....	7 1/8	3	90	5	34,800	Do.
5839	B	.....do	7	3	77	5	31,780	Do.
5840	C	.....do	7	3	94	4 1/8	31,060	One strand 2″ from splice.
5841	A	7″ manila.....	8 1/8	3	120	6	58,700	One strand at splice.
5842	B	.....do	7 1/8	3	111	5 1/8	58,750	Do.
5843	C	.....do	7 1/8	3	112	5 1/8	34,900	Do.
5844	A	1 1/8″ tarred hemp...	1 1/16	3	7	1 1/8	2,614	One strand 2″ from splice.
5845	C	.....do	1 1/8	3	6	1 1/16	1,918	One strand at splice.
5846	A	2″ tarred hemp....	2 1/8	3	14	1 1/8	2,995	Do.
5847	C	.....do	2 1/16	4	7	1 1/8	2,540	Do.
5848	A	2 1/8″ tarred hemp...	2 1/8	3	20	2 1/4	4,346	Do.
5849	C	.....do	2 1/16	4	10	2	3,225	Do.
5850	A	3″ tarred hemp....	3 1/16	3	28	2 1/8	5,567	Do.
5851	C	.....do	3 1/16	4	17	2 1/16	4,508	Do.
5852	A	3 1/8″ tarred hemp...	3 1/16	3	36	3	7,480	Do.
5853	C	.....do	3 1/8	4	23	3 1/16	7,360	Do.
5854	A	4″ tarred hemp....	4 1/16	3	45	3 1/2	8,540	Do.
5855	C	.....do	4 1/8	4	32	3 1/8	8,742	Do.
5901	.....	4″ Russia hemp...	4 1/8	3	70	3 1/2	15,020	Do.
5902	.....	3 1/2″ Russia hemp..	3 1/2	3	51	3 1/8	10,400	Do.
5903	.....	3″ Russia hemp...	3 1/8	3	39	2 1/8	9,720	Do.
5904	.....	2 1/2″ Russia hemp..	2 1/8	3	25	2 1/8	5,490	Do.
5905	.....	2″ Russia hemp...	2 1/8	3	18	2	3,980	Do.
5906	.....	1 1/2″ Russia hemp..	1 1/8	3	10	2	2,460	Do.

ENDURANCE OF ROTATING SHAFTS

FROM

COLD-ROLLED AND COLD-DRAWN STEEL BARS; ALSO HOT-ROLLED STEEL BARS.

ENDURANCE OF ROTATING SHAFTS.

Tests on the endurance of metals to repeated stresses under the conditions of rotating shafts transversely loaded are continued from previous years.

The present report contains the results with cold-rolled steel shafts which were run under different fiber stresses. A part of the number were run until rupture of the metal was reached, while the rotating tests of other bars were discontinued before rupture in this way, the shafts removed from the apparatus and annular tensile specimens taken out and subsequently tested. This was done to ascertain what effect the previous repeated stresses had produced on the tensile strength of the metals. Specimens from the middle of the length of the shafts, where the fiber stresses reached their maximum and from one end where the metal was unaffected during the rotating test, were taken.

Shafts loaded on a single bearing at the middle of their length received the load on a loose ring having a length of one-half inch on the shaft. Those with double bearings at the middle received the loads on two bearings, each one-half inch long and spaced 4 inches from center to center.

The double bearings are used to obtain a section uniformly strained along the length of the shaft, and there is opportunity for the shaft to rupture within the section under maximum stress without fracturing necessarily directly under the bearings.

Furthermore, when examining the effect of repeated stresses on the tensile strength of the metal, by means of the annular type of specimen, the chambered part of the specimen may be given a cylindrical bore for a length sufficient to observe the elastic limit and elongation prior to rupture, on that part of the metal between the double bearings.

There were annealed shafts of cold-rolled and cold-drawn steel. The endurance of the metal appeared to diminish as higher annealing temperatures were employed, although a notable exception was found in cold-drawn bar No. 186, not annealed, which ruptured with a lower number of rotations than companion bars which had been annealed.

In this report are some bars of a new lot of Gautier steel, representing metal in several grades, having in the different bars a range of carbon from 0.15 to 1.09 per cent. The bars were finished in the hot rolls 1¼ inches diameter, and are turned down to 1 inch diameter for these tests.

The first series of tests with these bars was made under a fiber stress of 60,000 pounds per square inch.

Running under this fiber stress at a speed of 400 rotations per minute caused the bars to acquire an increased temperature, which in the hottest bar reached 472° F.

One bar of each grade of steel was thus allowed to reach the maximum temperature which the conditions of the test permitted, and continued to be run until rupture.

Duplicate specimens were kept near atmospheric temperature by means of a stream of cold water played upon the specimen with a hose, the specimen not at any time during the test being allowed to acquire a temperature above 110° F.

A remarkable difference exists between the endurance of the hot and the cold bars, which is shown in the following table:

Carbon.	Total number of rotations.	
	Hot bars.	Cold bars.
Per cent.		
0.15	85,200	4,350
.17	32,300	3,950
.34	127,700	11,600
.55	111,800	11,950
.73	218,500	34,900
.82	148,200	42,000
1.09	99,200	23,000

The temperature of the hot bars did not remain constant during the tests, and it was not attempted to regulate or control the same.

The fluctuations in temperature were attributed to variations in the molecular friction of the metal in cases where the speed of rotation continued without interruption, and the lubrications of the bearings underwent no known change of condition.

When a shaft was first loaded the resistance against rotation was decidedly greater than its subsequent resistance, and in some cases the belt power of the rotating apparatus was insufficient to drive the shaft under full load, at the commencement of the test.

A gradual application of the load, however, enabled the resistance to be overcome, and after a few hundred rotations it was so far diminished that the belt was enabled to do the work thereafter.

This describes the behavior of several shafts, but in order to explain more fully the phenomena, it will be necessary to measure the power actually used in driving the shafts, accompanied by the thermometric observations of the part of the shafts receiving the maximum stresses.

Following the report of the rotating shafts are the results of tension specimens taken from ruptured and unruptured shafts.

These specimens are annular in form, in order to test only the outside metal of the shafts, or that part which has been subjected to overloads, provided the specimen was that taken from the middle of the shaft. Specimens from the outer end of the shafts were given the same form for direct comparison of results.

The results of the tensile tests show in three instances, endurance bars Nos. 166, 167, and 169, a large apparent reduction in the strength of the middle specimen over the end one, but the appearance of the fractures indicated that incipient rupture had begun in the endurance tests, and that minute fractures existed in the metal at the commencement of the tensile tests.

With specimens from endurance bar No. 182 there was a large apparent gain in the middle specimen over the end one.

The high annealing temperature to which this bar was exposed before the endurance test began appeared to have lowered the elastic limit and the tensile strength, but the middle section was restored to a higher tensile strength.

If the restoration was the direct result of the endurance test, the explanation is not inconsistent with observed facts in other tests.

In the other tests the gain or loss of the middle specimen fell within limits attributable to the variations in the original strength of the metal.

No. 176.

COLD-ROLLED STEEL.

Diameter 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
35,000	0	0	*a*	.2012	.1757	.2010	.0253	.0002	
			b	.2000	.1743	.1999	.0256	.0001	
			c	.2004	.1745	.2001	.0256	.0003	
	10,000	10,000	*a*	.2014	.1755	.2011	.0256	.0003	
			b	.2002	.1744	.1999	.0255	.0003	
			c	.2004	.1745	.2002	.0257	.0002	
	1,550,310	1,560,310	.....	.....	.....	.....	.....	.....	Bar ruptured.

No. 177.

COLD-ROLLED STEEL.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
35,000	0	0	*a*	.1998	.1740	.1996	.0256	.0002	
			b	.1999	.1740	.1996	.0256	.0003	
			c	.2014	.1756	.2011	.0255	.0003	
	10,000	10,000	*a*	.1991	.1732	.1990	.0258	.0001	
			b	.1991	.1734	.1990	.0256	.0001	
			c	.2007	.1749	.2005	.0256	.0002	
	490,000	500,000	*a*	.1996	.1738	.1994	.0256	.0002	
			b	.1998	.1738	.1995	.0257	.0003	
			c	.2014	.1754	.2011	.0257	.0003	
	500,000	1,000,000	*a*	.1999	.1741	.1998	.0257	.0001	
			b	.2001	.1742	.1998	.0256	.0003	
			c	.2015	.1757	.2013	.0256	.0002	
	500,000	1,500,000	*a*	.2001	.1741	.1999	.0258	.0002	
			b	.2001	.1740	.1998	.0258	.0003	
			c	.2014	.1755	.2011	.0256	.0003	
	500,000	2,000,000	*a*	.1999	.1741	.1998	.0257	.0001	
			b	.2000	.1741	.1998	.0257	.0002	
			c	.2016	.1757	.2014	.0257	.0002	
	500,000	2,500,000	*a*	.1999	.1740	.1998	.0258	.0001	
			b	.2001	.1742	.1999	.0257	.0002	
			c	.2017	.1757	.2014	.0257	.0003	
	500,000	3,000,000	*a*	.2000	.1745	.1998	.0253	.0002	
			b	.2002	.1744	.1999	.0255	.0003	
			c	.2018	.1761	.2015	.0254	.0003	
	500,000	3,500,000	*a*	.2000	.1743	.1999	.0256	.0001	
			b	.2004	.1745	.2000	.0255	.0004	
			c	.2018	.1760	.2015	.0255	.0003	
	329,400	3,829,400	.....	.....	.....	.....	.....	.....	Bar ruptured 2″ from middle bearing.

No. 178.

COLD-ROLLED STEEL.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflection.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
35,000	0	0	*a*	.1995	.1737	.1994	.0257	.0001	
			b	.2021	.1763	.2019	.0256	.0002	
			c	.2015	.1758	.2014	.0256	.0001	
	10,000	10,000	*a*	.1995	.1738	.1995	.0257	0.	
			b	.2021	.1763	.2020	.0257	.0001	
			c	.2016	.1758	.2014	.0256	.0002	
	490,000	500,000	*a*	.1996	.1742	.1993	.0253	.0001	
			b	.2020	.1765	.2019	.0254	.0001	
			c	.2016	.1761	.2014	.0253	.0002	
	500,000	1,000,000	*a*	.1998	.1741	.1996	.0255	.0002	
			b	.2021	.1766	.2020	.0254	.0001	
			c	.2018	.1762	.2017	.0255	.0001	
	500,000	1,500,000	*a*	.1998	.1741	.1996	.0255	.0002	
			b	.2021	.1766	.2020	.0254	.0001	
			c	.2018	.1760	.2016	.0256	.0002	
	510,000	2,010,000	*a*	.1998	.1742	.1996	.0254	.0002	
			b	.2021	.1766	.2020	.0254	.0001	
			c	.2018	.1760	.2016	.0256	.0002	
	491,000	2,501,000	*a*	.1998	.1745	.1996	.0251	.0002	
			b	.2020	.1766	.2019	.0253	.0001	
			c	.2018	.1761	.2015	.0254	.0003	
	499,000	3,000,000	*a*	.1997	.1742	.1996	.0254	.0001	
			b	.2020	.1766	.2019	.0253	.0001	
			c	.2018	.1761	.2016	.0255	.0002	
	500,000	3,500,000	*a*	.1997	.1740	.1996	.0256	.0001	
			b	.2021	.1765	.2019	.0254	.0002	
			c	.2018	.1761	.2015	.0254	.0003	
	500,000	4,000,000	*a*	.1997	.1742	.1997	.0255	0.	
			b	.2021	.1765	.2019	.0254	.0002	
			c	.2020	.1764	.2019	.0255	.0001	
	500,000	4,500,000	*a*	.1997	.1740	.1996	.0256	.0001	
			b	.2021	.1764	.2019	.0255	.0002	
			c	.2019	.1761	.2015	.0254	.0004	
	500,000	5,000,000	*a*	.1998	.1740	.1997	.0257	.0001	
			b	.2021	.1765	.2020	.0255	.0001	
			c	.2020	.1761	.2017	.0256	.0003	Middle bearing cutting.
	2,598,540	7,598,540	.....	.....	.....	.....	.....	.....	Bar ruptured.

No. 185.

COLD-ROLLED STEEL.

Annealed at an estimated temperature of 1,783° F.
Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.1993	.1699	.1992	.0293	.0001	
			b	.1993	.1700	.1995	.0295	−.0002	
			c	.1997	.1701	2001	.0300	−.0004	
	5,000	5,000	*a*	.2009	.1707	.2005	.0298	.0004	
			b	.2010	.1709	.2008	.0299	.0002	
			c	.2015	.1719	.2015	.0296	0.	
	5,000	10,000	*a*	.2006	.1709	.2005	.0296	.0001	
			b	.2010	.1710	.2008	.0298	.0002	
			c	.2016	.1718	.2015	.0297	.0001	
	40,000	50,000	*a*	.2006	.1710	.2005	.0295	.0001	
			b	.2010	.1708	.2007	.0299	.0003	
			c	.2017	.1717	.2014	.0297	.0003	
	51,000	101,000	*a*	.2009	.1710	.2005	.0295	.0004	
			b	.2009	.1709	.2007	.0298	.0002	
			c	.2018	.1719	.2017	.0298	.0001	
	53,000	154,000	*a*	.2008	.1712	.2006	.0294	.0002	
			b	.2009	.1710	.2007	.0297	.0002	
			c	.2019	.1718	.2017	.0299	.0002	
	56,000	210,000	*a*	.2008	.1710	.2006	.0296	.0002	
			b	.2009	.1710	.2008	.0298	.0001	
			c	.2018	.1717	.2016	.0299	.0002	
	28,880	238,880							Bar ruptured 3″ from center at a small drilled hole defining the 6″ gauged section used in determining the annealing temperature.

No. 170.

COLD-ROLLED STEEL.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
45,000	0	0	*a*	.2006	.1675	.2004	.0329	.0002	
			b	.1995	.1664	.1992	.0328	.0003	
			c	.1995	.1665	.1993	.0328	.0002	
	10,000	10,000	*a*	.2008	.1675	.2004	.0329	.0004	
			b	.1995	.1663	.1990	.0327	.0005	
			c	.1996	.1664	.1994	.0330	.0002	
	142,580	152,580	.....	.....	.....	.....	.....	.....	Bar ruptured.

No. 171.

COLD-ROLLED STEEL.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflection measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
45,000	0	0	*a*	.2016	.1686	.2014	.0328	.0002	
			b	.2011	.1680	.2009	.0329	.0002	
			c	.2020	.1687	.2017	.0330	.0003	
	10,000	10,000	*a*	.2014	.1685	.2014	.0329	0.	
			b	.2011	.1678	.2009	.0331	.0002	
			c	.2022	.1689	.2020	.0331	.0002	
	141,000	151,000	.....	.....	.....	.....	.....	.....	Bar ruptured.

No. 172.

COLD-ROLLED STEEL.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
45,000	0	0	*a*	.1997	.1666	.1995	.0329	.0002	
			b	.2009	.1676	.2006	.0330	.0003	
			c	.2007	.1676	.2005	.0329	.0002	
	10,000	10,000	*a*	.1997	.1666	.1994	.0328	.0003	
			b	.2010	.1676	.2006	.0330	.0004	
			c	.2009	.1678	.2005	.0327	.0004	
	40,200	50,200	*a*	.1998	.1665	.1995	.0330	.0003	
			b	.2007	.1678	.2005	.0327	.0002	
			c	.2009	.1678	.2005	.0327	.0004	
									Test discontinued.

No. 173.

COLD-ROLLED STEEL.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
45,000	0	0	*a*	.2000	.1670	.1998	.0328	.0002	
			b	.2005	.1673	.2002	.0329	.0003	
			c	.2032	.1699	.2028	.0329	.0004	
	13,400	13,400	*a*	.2002	.1670	.1999	.0329	.0003	
			b	.2005	.1672	.2003	.0331	.0002	
			c	.2034	.1701	.2031	.0330	.0003	
	36,600	50,000	*a*	.1999	.1668	.1997	.0329	.0002	
			b	.2004	.1674	.2002	.0328	.0002	
			c	.2034	.1701	.2030	.0329	.0004	
									Test discontinued.

No. 174.

Cold-Rolled Steel.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
45,000	0	0	*a*	.2009	.1680	.2007	.0327	.0002	
			b	.2008	.1674	.2005	.0331	.0003	
			c	.2016	.1685	.2015	.0330	.0001	
	10,000	10,000	*a*	.2010	.1678	.2008	.0330	.0002	
			b	.2009	.1676	.2006	.0330	.0003	
			c	.2024	.1690	.2020	.0330	.0004	
	40,000	50,000	*a*	.2006	.1675	.2006	.0331	0.	
			b	.2010	.1678	.2005	.0327	.0005	
			c	.2020	.1684	.2015	.0331	.0005	Test discontinued.

No. 175.

Cold-Rolled Steel.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
45,000	0	0	*a*	.2014	.1682	.2011	.0329	.0003	
			b	.2004	.1671	.2001	.0330	.0003	
			c	.2009	.1678	.2007	.0329	.0002	
	10,000	10,000	*a*	.2013	.1679	.2010	.0331	.0003	
			b	.2002	.1669	.2000	.0331	.0002	
			c	.2009	.1677	.2005	.0328	.0004	
	40,000	50,000	*a*	.2011	.1681	.2010	.0329	.0001	
			b	.2002	.1670	.1999	.0329	.0003	
			c	.2011	.1678	.2007	.0329	.0004	Test discontinued.

No. 161.

COLD-ROLLED STEEL.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
55,000	0	0	*a*	.2006	.1602	.2005	.0403	.0001	
			b	.2018	.1610	.2012	.0402	.0006	
			c	.2010	.1605	.2009	.0404	.0001	
	10,000	10,000	*a*	.2002	.1590	.1999	.0409	.0003	
			b	.2022	.1595	.2002	.0407	.0020	
			c	.2018	.1599	.2007	.0408	.0011	
	93,340	103,340							Bar ruptured.

No. 162.

COLD-ROLLED STEEL.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
55,000	0	0	*a*	.1999	.1592	.1997	.0405	.0002	
			b	.1998	.1591	.1995	.0404	.0003	
			c	.2017	.1611	.2015	.0404	.0002	
	10,000	10,000	*a*	.2014	.1586	.1989	.0403	.0025	
			b	.2008	.1584	.1987	.0403	.0021	
			c	.2024	.1600	.2004	.0404	.0020	
	42,400	52,400							Bar ruptured.

No. 163.

COLD-ROLLED STEEL.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
55,000	0	0	*a*	.2008	.1602	.2007	.0405	.0001	
			b	.1992	.1584	.1987	.0403	.0005	
			c	.2022	.1613	.2020	.0407	.0002	
	10,000	10,000	*a*	.2015	.1600	.2005	.0405	.0010	
			b	.1979	.1563	.1970	.0407	.0009	
			c	.2036	.1610	.2016	.0406	.0020	
	67,500	77,500	.....	.....	.....	.....	.....	.....	Bar ruptured.

No. 165.

COLD-ROLLED STEEL.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
55,000	0	0	*a*	.1988	.1579	.1985	.0406	.0003	
			b	.2040	.1632	.2037	.0405	.0003	
			c	.2006	.1598	.2003	.0405	.0003	
	10,000	10,000	*a*	.1973	.1564	.1970	.0406	.0003	
			b	.2057	.1619	.2028	.0409	.0029	
			c	.2015	.1585	.1991	.0406	.0024	
	38,100	48,100	.....	.....	.....	.....	.....	.....	Bar ruptured.

No. 164.

COLD-ROLLED STEEL.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
55,000	0	0	*a*	.2007	.1601	.2005	.0404	.0002	
			b	.2006	.1597	.2004	.0407	.0002	
			c	.2001	.1590	.1999	.0409	.0002	
	10,000	10,000	*a*	.2000	.1590	.2000	.0410	0.	
			b	.2005	.1583	.1990	.0407	.0015	
			c	.2018	.1580	.1990	.0410	.0028	
	40,000	50,000	*a*	.2056	.1606	.2013	.0407	.0043	
			b	.2040	.1600	.2006	.0406	.0034	
			c	.1987	.1559	.1966	.0407	.0021	
									Test discontinued.

No. 166.

COLD-ROLLED STEEL.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
55,000	0	0	*a*	.2001	.1596	.1999	.0403	.0002	
			b	.2012	.1605	.2011	.0406	.0001	
			c	.2021	.1613	.2020	.0407	.0001	
	10,000	10,000	*a*	.2010	.1583	.1990	.0407	.0020	
			b	.2024	.1593	.2002	.0409	.0022	
			c	.2027	.1604	.2011	.0407	.0016	
	40,000	50,000	*a*	.2034	.1592	.2001	.0409	.0033	
			b	.2035	.1605	.2013	.0408	.0022	
			c	.2010	.1585	.1993	.0408	.0017	
									Test discontinued.

No. 167.

COLD-ROLLED STEEL.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
55,000	0	0	*a*	.2005	.1599	.2004	.0405	.0001	
			b	.2004	.1599	.2001	.0402	.0003	
			c	.2019	.1613	.2016	.0403	.0003	
	10,000	10,000	*a*	.2020	.1585	.1995	.0410	.0025	
			b	.2013	.1586	.1994	.0408	.0019	
			c	2024	.1603	.2009	.0406	.0015	
	40,000	50,000	*a*	.1988	.1575	.1980	.0405	.0008	
			b	.1983	.1560	.1970	.0410	.0013	
			c	.2060	.1599	.2005	.0406	.0055	
									Test discontinued.

No. 168.

COLD-ROLLED STEEL.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
55,000	0	0	*a*	.2012	.1605	.2010	.0405	.0002	
			b	.2002	.1596	.1999	.0403	.0003	
			c	.2003	.1595	.2000	.0405	.0003	
	10,000	10,000	*a*	.1994	.1586	.1993	.0407	.0001	
			b	.2011	.1586	.1989	.0403	.0022	
			c	.2015	.1588	.1994	.0406	.0021	
	40,000	50,000	*a*	.1976	.1564	.1974	.0410	.0002	
			b	.2044	.1583	.1987	.0404	.0057	
			c	.2020	.1580	.1988	.0408	.0032	
									Test discontinued.

No. 169.

COLD-ROLLED STEEL.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
55,000	0	0	*a*	.2017	.1610	.2014	.0404	.0003	
			b	.1996	.1590	.1994	.0404	.0002	
			c	.2009	.1601	.2005	.0404	.0004	
	10,000	10,000	*a*	.2023	.1599	.2006	.0407	.0017	
			b	.2007	.1581	.1986	.0405	.0021	
			c	.2014	.1595	.1999	.0404	.0015	
	40,000	50,000	*a*	.2049	.1604	.2009	.0405	.0040	
			b	.1994	.1570	.1976	.0406	.0018	
			c	.2021	.1588	.1994	.0406	.0027	
									Test discontinued.

No. 160.

COLD-DRAWN STEEL.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
35,000	0	0	*a*	.2027	.1767	.2026	.0259	.0001	
			b	.2027	.1768	.2025	.0257	.0002	
			c	.2040	.1781	.2039	.0258	.0001	
	10,000	10,000	*a*	.2028	.1768	.2028	.0260	0.	
			b	.2025	.1769	.2026	.0257	−.0001	
			c	.2040	.1781	.2039	.0258	+.0001	
	690,000	700,000	*a*	.2029	.1768	.2028	.0260	.0001	
			b	.2029	.1770	.2028	.0258	.0001	
			c	.2040	.1780	.2039	.0259	.0001	
									Bar removed from machine.

No. 155.

COLD-DRAWN STEEL.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2019	.1722	.2018	.0296	.0001	
			b	.2030	.1734	.2029	.0295	.0001	
			c	.2040	.1745	.2040	.0295	0.	
	10,000	10,000	*a*	.2019	.1722	.2018	.0296	.0001	
			b	.2031	.1735	.2030	.0295	.0001	
			c	.2041	.1746	.2041	.0295	0.	
	1,102,140	1,112,140	.....	.....	.....	.....	.....	.....	Bar ruptured.

No. 156.

COLD-DRAWN STEEL.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2042	.1744	.2042	.0298	0.	
			b	.2057	.1759	.2056	.0297	.0001	
			c	.2061	.1764	.2060	.0296	.0001	
	10,000	10,000	*a*	.2042	.1743	.2041	.0298	.0001	
			b	.2056	.1759	.2056	.0297	0.	
			c	.2060	.1762	.2059	.0297	.0001	
	698,300	708,300	.....	.....	.....	.....	.....	.....	Bar ruptured.

No. 157.

COLD-DRAWN STEEL.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2024	.1720	.2022	.0293	.0002	
			b	.2021	.1728	.2021	.0293	0.	
			c	.2018	.1724	.2017	.0293	.0001	
	10,000	10,000	*a*	.2023	.1725	.2022	.0297	.0001	
			b	.2021	.1726	.2021	.0295	0.	
			c	.2017	.1722	.2017	.0295	0.	
	475,260	485,260	.....	.....	.....	.....	.....	.....	Bar ruptured.

No. 158.

COLD-DRAWN STEEL.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2054	.1757	.2054	.0297	0.	
			b	.2056	.1758	.2055	.0297	.0001	
			c	.2047	.1749	.2046	.0297	.0001	
	10,000	10,000	*a*	.2052	.1756	.2054	.0298	—.0002	
			b	.2056	.1760	.2057	.0297	—.0001	
			c	.2046	.1749	.2045	.0296	+.0001	
	362,370	372,370	.....	.....	.....	.....	.....	.....	Bar ruptured.

No. 159.

Cold-Drawn Steel.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2046	.1749	.2045	.0296	.0001	
			b	.2023	.1726	.2022	.0296	.0001	
			c	.2029	.1731	.2028	.0297	.0001	
	10,000	10,000	*a*	.2043	.1745	.2042	.0297	.0001	
			b	.2028	.1729	.2025	.0296	.0003	
			c	.2028	.1729	.2026	.0297	.0002	
	455,120	465,120	.....	.....	.....	.....	.....	.....	Bar ruptured.

No. 188.

Cold-Drawn Steel.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2028	.1735	.2028	.0293	0.	
			b	.2045	.1753	.2045	.0292	0.	
			c	.2032	.1738	.2030	.0292	.0002	
	5,000	5,000	*a*	.2029	.1734	.2029	.0295	0.	
			b	.2046	.1751	.2046	.0295	0.	
			c	.2033	.1737	.2032	.0295	.0001	
	5,000	10,000	*a*	.2030	.1733	.2028	.0295	.0002	
			b	.2045	.1750	.2045	.0295	0.	
			c	.2032	.1737	.2032	.0295	0.	
	40,000	50,000	*a*	.2030	.1736	.2028	.0292	.0002	
			b	.2046	.1751	.2045	.0294	.0001	
			c	.2033	.1737	.2032	.0295	.0001	
	50,000	100,000	*a*	.2029	.1732	.2027	.0295	.0002	
			b	.2044	.1749	.2044	.0295	0.	
			c	.2032	.1736	.2030	.0294	.0002	
	100,000	200,000	*a*	.2030	.1735	.2028	.0293	.0002	
			b	.2046	.1752	.2044	.0292	.0002	
			c	.2032	.1737	.2031	.0294	.0001	
	106,000	306,000	*a*	.2031	.1731	.2028	.0297	.0003	
			b	.2045	.1746	.2043	.0297	.0002	
			c	.2032	.1737	.2030	.0293	.0002	
	107,000	413,000	*a*	.2029	.1734	.2029	.0295	0.	
			b	.2046	.1749	.2044	.0295	.0002	
			c	.2034	.1736	.2031	.0295	.0003	
	101,500	514,500	*a*	.2028	.1731	.2027	.0296	.0001	
			b	.2045	.1750	.2044	.0294	.0001	
			c	.2034	.1732	.2032	.0300	.0002	
	39,200	553,700	.....	.....	.....	.....	.....	.....	Bar ruptured.

No. 153.

COLD-DRAWN STEEL.

Diameter 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
45,000	0	0	*a*	.2015	.1684	.2014	.0330	.0001	
			b	.2024	.1692	.2023	.0331	.0001	
			c	.2028	.1695	.2026	.0331	.0002	
	10,000	10,000	*a*	.2014	.1680	.2013	.0333	.0001	
			b	.2024	.1690	.2023	.0333	.0001	
			c	.2029	.1694	.2026	.0332	.0003	
	344,450	354,450	.....	.....	.....	.....	.....	.....	Bar ruptured.

No. 154.

COLD-DRAWN STEEL.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
45,000	0	0	*a*	.2024	.1692	.2024	.0332	0.	
			b	.2017	.1686	.2016	.0330	.0001	
			c	.2020	.1688	.2020	.0332	0.	
	10,000	10,000	*a*	.2027	.1690	.2024	.0334	.0003	
			b	.2016	.1684	.2016	.0332	0.	
			c	.2020	.1686	.2018	.0332	.0002	
	273,550	283,550	.....	.....	.....	.....	.....	.....	Bar ruptured.

No. 149.

COLD-DRAWN STEEL.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
50,000	0	0	*a*	.2050	.1679	.2050	.0371	0.	
			b	.2059	.1685	.2059	.0374	0.	
			c	.2046	.1673	.2045	.0372	.0001	
	10,000	10,000	*a*	.2053	.1673	.2046	.0373	.0007	
			b	.2058	.1680	.2053	.0373	.0005	
			c	.2051	.1667	.2042	.0375	.0009	
	94,100	104,000	.....	.....	.....	.....	.....	.....	Bar ruptured.

No. 150.

COLD-DRAWN STEEL.

Diameter 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
50,000	0	0	*a*	.2035	.1661	.2034	.0373	.0001	
			b	.2034	.1660	.2031	.0371	.0003	
			c	.2034	.1659	.2033	.0374	.0001	
	10,500	10,500	*a*	.2023	.1651	.2021	.0370	.0002	
			b	.2043	.1652	.2026	.0374	.0017	
			c	.2041	.1657	.2029	.0372	.0012	
	86,500	97,000	.....	.....	.....	.....	.....	.....	Bar ruptured.

No. 151.

COLD-DRAWN STEEL.

Diameter 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
55,000	0	0	*a*	.2024	.1617	.2022	.0405	.0002	
			b	.2027	.1615	.2023	.0408	.0004	
			c	.2030	.1620	.2028	.0408	.0002	
	10,000	10,000	*a*	.2017	.1600	.2010	.0410	.0007	
			b	.2018	.1595	.2005	.0410	.0013	
			c	.2052	.1604	.2015	.0411	.0037	
	47,300	57,300	.....	.....	.....	.....	.....	.....	Bar ruptured.

No. 152.

COLD-DRAWN STEEL.

Diameter 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
55,000	0	0	*a*	.2013	.1604	.2011	.0407	.0002	
			b	.2012	.1606	.2010	.0404	.0002	
			c	.2042	.1624	.2032	.0408	.0010	
	10,000	10,000	*a*	.1998	.1567	.1980	.0413	.0018	
			b	.2070	.1587	.2000	.0413	.0070	
			c	.2045	.1584	.1997	.0413	.0048	
	30,400	40,400	.....	.....	.....	.....	.....	.....	Bar ruptured. Temperature, 200° F.

No. 179.

COLD-ROLLED STEEL.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Loaded over 4″ length at middle.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2023	.1710	.2023	.0313	0.	
			b	.2007	.1691	.2005	.0314	.0002	
			c	.2007	.1694	.2005	.0311	.0002	
	10,000	10,000	*a*	.2023	.1702	.2022	.0320	.0001	
			b	.2006	.1685	.2003	.0318	.0003	Temperature of bar increased to 130° F.
			c	.2006	.1688	.2003	.0315	.0003	
	40,000	50,000	*a*	.2017	.1688	.2016	.0328	.0001	
			b	.2003	.1675	.2000	.0325	.0003	
			c	.2004	.1679	.2002	.0323	.0002	
	50,000	100,000	*a*	.2018	.1698	.2020	.0322	−.0002	
			b	.2006	.1686	.2004	.0318	.0002	
			c	.2006	.1688	.2003	.0315	.0003	
	100,000	200,000	*a*	.2020	.1697	.2021	.0324	−.0001	
			b	.2005	.1683	.2003	.0320	.0002	
			c	.2005	.1688	.2003	.0315	.0002	
	204,000	404,000	*a*	.2029	.1705	.2023	.0318	.0006	
			b	.2008	.1683	.2003	.0320	.0005	
			c	.2008	.1688	.2003	.0315	.0005	
	196,000	600,000	*a*	.2020	.1696	.2022	.0326	−.0002	
			b	.2006	.1681	.2003	.0322	.0003	
			c	.2005	.1680	.2003	.0323	.0002	
	257,400	857,400	.....	.....	.....	.....	.....	.....	Bar ruptured at one extremity of 4″ loaded section.

No. 181.

COLD-ROLLED STEEL.

Annealed at an estimated temperature of 645° F.
Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Loaded over 4″ length at middle.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2004	.1683	.2002	.0319	.0002	
			b	.2005	.1686	.2003	.0317	.0002	
			c	.2005	.1683	.2003	.0320	.0002	
	5,000	5,000	*a*	.2002	.1685	.2002	.0317	0.	
			b	.2005	.1683	.2003	.0320	.0002	
			c	.2005	.1684	.2001	.0317	.0004	
	5,000	10,000	*a*	.2004	.1682	.2000	.0318	.0004	
			b	.2005	.1687	.2003	.0316	.0002	
			c	.2004	.1683	.2001	.0318	.0003	
	40,000	50,000	*a*	.2000	.1681	.2000	.0319	0.	
			b	.2006	.1683	.2003	.0320	.0003	
			c	.2004	.1680	.2001	.0321	.0003	
	54,400	104,400	*a*	.2006	.1683	.2003	.0320	.0003	
			b	.2006	.1683	.2004	.0321	.0002	
			c	.2005	.1680	.2000	.0320	.0005	
	52,600	157,000	*a*	.2000	.1680	.2000	.0320	0.	
			b	.2006	.1680	.2003	.0323	.0003	
			c	.2005	.1682	.2000	.0318	.0005	
	43,000	200,000	*a*	.2002	.1679	.2001	.0322	.0001	
			b	.2003	.1675	.2001	.0326	.0002	
			c	.2005	.1680	.2001	.0321	.0004	
	34,300	234,300	.....	.....	.....	.....	.....	.....	Bar ruptured 1″ outside the 4″ loaded section at a drilled hole defining 6″ gauged length used in measuring the expansion when determining the annealing temperature.

No. 180.

COLD-ROLLED STEEL.

Annealed at an estimated temperature of 1,032° F.
Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Loaded over 4″ length at middle.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2009	.1692	.2008	.0316	.0001	
			b	.2009	.1689	.2007	.0318	.0002	
			c	.2009	.1688	.2006	.0318	.0003	
	5,000	5,000	*a*	.2008	.1684	.2007	.0323	.0001	
			b	.2008	.1689	.2007	.0318	.0001	
			c	.2008	.1685	.2007	.0322	.0001	
	5,000	10,000	*a*	.2008	.1685	.2007	.0322	.0001	
			b	.2008	.1688	.2007	.0319	.0001	
			c	.2010	.1687	.2008	.0321	.0002	
	40,000	50,000	*a*	.2007	.1693	.2007	.0314	0.	
			b	.2010	.1685	.2007	.0322	.0003	
			c	.2009	.1685	.2005	.0320	.0004	
	50,000	100,000	*a*	.2008	.1689	.2008	.0319	0.	
			b	.2010	.1688	.2008	.0320	.0002	
			c	.2010	.1687	.2006	.0319	.0004	
	50,000	150,000	*a*	.2007	.1683	.2007	.0324	0.	
			b	.2009	.1684	.2008	.0324	.0001	
			c	.2010	.1684	.2007	.0323	.0003	
	61,000	211,000	.....	.....	.....	.....	.....	.....	Bar ruptured 1″ outside the 4″ loaded section at a drilled hole defining 6″ gauged length used in measuring the expansion when determining the annealing temperature.

No. 183.

COLD-ROLLED STEEL.

Annealed at an estimated temperature of 1,370° F.
Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Loaded over 4″ length at middle.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2020	.1703	.2018	.0315	.0002	
			b	.2011	.1690	.2008	.0318	.0003	
			c	.2010	.1689	.2007	.0318	.0003	
	5,000	5,000	*a*	.2021	.1695	.2017	.0322	.0004	
			b	.2011	.1684	.2005	.0321	.0006	
			c	.2010	.1687	.2006	.0319	.0004	
	5,000	10,000	*a*	.2020	.1697	.2017	.0320	.0003	
			b	.2008	.1683	.2005	.0322	.0003	
			c	.2008	.1687	.2005	.0318	.0003	
	42,000	52,000	*a*	.2020	.1697	.2019	.0322	.0001	
			b	.2010	.1688	.2008	.0320	.0002	
			c	.2011	.1687	.2007	.0320	.0004	
	100,000	152,000	*a*	.2016	.1691	.2015	.0324	.0001	
			b	.2011	.1682	.2005	.0323	.0006	
			c	.2009	.1683	.2006	.0323	.0003	
	42,000	194,000	.....	.....	.....	.....	.....	.....	Bar ruptured 1″ outside the 4″ loaded section at a drilled hole used in defining 6″ gauged length when determining the annealing temperature.

No. 184.

COLD-ROLLED STEEL.

Annealed at an estimated temperature of 1,375° F.
Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Loaded over 4″ length at middle.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2004	.1682	.2001	.0319	.0003	
			b	.2000	.1684	.1988	.0304	.0012	
			c	.2020	.1700	.2016	.0316	.0004	
	5,000	5,000	*a*	.2003	.1681	.2000	.0319	.0003	
			b	.2001	.1681	.1998	.0317	.0003	
			c	.2018	.1697	.2015	.0318	.0003	
									Fixtures changed and now loaded on single ring bearing at middle.
	0	5,000	*a*	.2000	.1705	.1996	.0291	.0004	
			b	.2018	.1719	.2014	.0295	.0004	
			c	.2002	.1707	.2000	.0293	.0002	
	5,000	10,000	*a*	.1999	.1706	.1997	.0291	.0002	
			b	.2017	.1722	.2014	.0292	.0003	
			c	.2003	.1706	.1999	.0293	.0004	
	233,200	243,200	.....	.....	.....	.....	.....	.....	Bar ruptured at middle under single ring bearing.

No. 182.

COLD-ROLLED STEEL.

Annealed at an estimated temperature of 1,800° F.
Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Loaded over 4″ length at middle.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.1954	.1634	.1953	.0319	.0001	
			b	.2001	.1680	.2000	.0320	.0001	
			c	.1998	.1677	.1998	.0321	0.	
	5,000	5,000	*a*	.1967	.1639	.1970	.0331	—.0003	
			b	.1983	.1684	.2011	.0327	—.0028	
			c	.1984	.1668	.1992	.0324	—.0008	
	5,000	10,000	*a*	.1977	.1651	.1978	.0327	—.0001	
			b	.2024	.1696	.2024	.0328	0.	
			c	.2009	.1683	.2008	.0325	.0001	
	40,000	50,000	*a*	.1974	.1651	.1974	.0323	0.	
			b	.2049	.1712	.2044	.0332	.0005	
			c	.2010	.1677	.2005	.0328	.0005	
	52,000	102,000	.....	.....	.....	.....	.....	.....	Bar ruptured 1″ outside the 4″ loaded section at a drilled hole used in defining 6″ gauged length when determining annealing temperature.

No. 186.

COLD-DRAWN STEEL.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Loaded over 4″ length at middle.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2023	.1703	.2021	.0318	.0002	
			b	.2021	.1703	.2020	.0317	.0001	
			c	.2021	.1706	.2020	.0314	.0001	
	10,000	10,000	*a*	.2018	.1699	.2018	.0319	0.	
			b	.2018	.1695	.2018	.0323	0.	
			c	.2019	.1701	.2018	.0317	.0001	
	90,000	100,000	*a*	.2020	.1702	.2017	.0315	.0003	
			b	.2019	.1696	.2017	.0321	.0002	
			c	.2022	.1695	.2016	.0321	.0006	
	100,000	200,000	*a*	.2025	.1706	.2018	.0312	.0007	
			b	.2024	.1700	.2018	.0318	.0006	
			c	.2021	.1697	.2015	.0318	.0006	
	400,000	600,000	*a*	.2017	.1693	.2015	.0322	.0002	
			b	.2031	.1700	.2017	.0317	.0014	
			c	.2028	.1700	.2017	.0317	.0011	
	200,000	800,000	*a*	.2006	.1680	.2006	.0326	0.	
			b	.2023	.1688	.2011	.0323	.0012	
			c	.2030	.1684	.2012	.0328	.0018	
	38,200	838,200	.....	.....	.....	.....	.....	.....	Bar ruptured 1″ inside the 4″ loaded section.

No. 187.

COLD-DRAWN STEEL.

Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Loaded over 4″ length at middle.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2058	.1732	.2056	.0324	.0002	
			b	.2059	.1740	.2058	.0318	.0001	
			c	.2058	.1733	.2056	.0323	.0002	
	10,000	10,000	*a*	.2056	.1735	.2056	.0321	0.	
			b	.2058	.1733	.2058	.0325	0.	
			c	.2052	.1730	.2052	.0322	0.	
	90,000	100,000	*a*	.2057	.1740	.2057	.0317	0.	
			b	.2057	.1735	.2056	.0321	.0001	
			c	.2058	.1734	.2057	.0323	.0001	
	115,000	215,000	*a*	.2058	.1729	.2055	.0326	.0003	
			b	.2058	.1731	.2057	.0326	.0001	
			c	.2057	.1734	.2055	.0321	.0002	
	389,000	604,000	*a*	.2060	.1727	.2055	.0328	.0005	
			b	.2059	.1732	.2057	.0325	.0002	
			c	.2057	.1734	.2056	.0322	.0001	Test discontinued.

No. 197.

COLD-DRAWN STEEL.

Annealed 2 hours at an estimated temperature of 454° F.
Diameter 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Loaded over 4″ length at middle.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2039	.1719	.2038	.0319	.0001	
			b	.2030	.1712	.2029	.0317	.0001	
			c	.2011	.1693	.2010	.0317	.0001	
	5,000	5,000		.2039	.1715	.2038	.0323	.0001	Temperature of about 140° F.
			b	.2030	.1709	.2029	.0320	.0001	
			c	.2011	.1689	.2010	.0321	.0001	
	6,000	11,000	*a*	.2039	.1718	.2038	.0320	.0001	
			b	.2030	.1709	.2029	.0320	.0001	
			c	.2011	.1689	.2010	.0321	.0001	
	39,000	50,000	*a*	.2039	.1719	.2038	.0319	.0001	
			b	.2030	.1712	.2029	.0317	.0001	
			c	.2011	.1690	.2010	.0320	.0001	
	50,000	100,000	*a*	.2039	.1721	.2038	.0318	0.	
			b	.2030	.1711	.2029	.0318	.0001	
			c	.2011	.1692	.2010	.0318	.0001	
	120,000	220,000	*a*	.2039	.1717	.2038	.0321	.0001	
			b	.2030	.1711	.2029	.0318	.0001	
			c	.2011	.1690	.2010	.0320	.0001	
									At 310,000 rotations temperature of bar about 100° F.
	290,000	510,000	*a*	.2039	.1717	.2038	.0321	.0001	
			b	.2030	.1709	.2029	.0320	.0001	
			c	.2012	.1694	.2010	.0316	.0002	
	510,000	1,020,000	*a*	.2040	.1717	.2039	.0322	.0001	
			b	.2029	.1708	.2028	.0320	.0001	
			c	.2013	.1693	.2012	.0319	.0001	
	229,800	1,249,800	.....	.....	.....	.....	.....	.....	Bar ruptured between bearings, about 1″.3 from center of north bearing. Temperature about 100° F.

No. 196.

COLD-DRAWN STEEL.

Annealed at an estimated temperature of 552° F.
Diameter 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Loaded over 4″ length at middle.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2002	.1679	.2000	.0321	.0002	
			b	.2029	.1714	.2029	.0315	0.	
			c	.2058	.1742	.2058	.0316	0.	
	5,000	5,000	*a*	.1999	.1675	.1997	.0322	.0002	
			b	.2030	.1713	.2030	.0317	0.	
			c	.2060	.1738	.2058	.0320	.0002	
	5,000	10,000	*a*	.1999	.1676	.1998	.0322	.0002	
			b	.2030	.1712	.2030	.0318	0.	
			c	.2060	.1737	.2058	.0321	.0002	
	40,000	50,000	*a*	.1998	.1676	.1997	.0321	.0001	
			b	.2030	.1710	.2030	.0320	0.	
			c	.2060	.1736	.2058	.0322	.0002	
	57,000	107,000	*a*	.1998	.1676	.1997	.0321	.0001	
			b	.2031	.1710	.2029	.0319	.0002	
			c	.2060	.1737	.2058	.0321	.0002	
	93,000	200,000	*a*	.1999	.1678	.1998	.0320	.0001	
			b	.2030	.1710	.2029	.0319	.0001	
			c	.2060	.1736	.2058	.0322	.0002	
	300,000	500,000	*a*	.1997	.1675	.1997	.0321	0.	
			b	.2030	.1711	.2029	.0328	.0001	
			c	.2060	.1737	.2058	.0321	.0002	
	522,000	1,022,000	*a*	.1997	.1675	.1996	.0321	.0001	
			b	.2032	.1711	.2031	.0320	.0001	
			c	.2060	.1735	.2058	.0323	.0002	
	484,000	1,506,000	*a*	.1997	.1676	.1996	.0320	.0001	
			b	.2034	.1711	.2032	.0321	.0002	
			c	.2060	.1736	.2058	.0322	.0002	
	507,000	2,013,000	*a*	.2000	.1676	.1998	.0322	.0002	
			b	.2033	.1711	.2030	.0319	.0003	
			c	.2060	.1739	.2058	.0319	.0002	
	302,500	2,315,500							Bar ruptured about midway between the end bearings.

No. 191.

COLD-DRAWN STEEL.

Annealed at an estimated temperature of 673° F.
Diameter 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Loaded over 4″ length at middle.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2009	.1693	.2007	.0314	.0002	
			b	.2021	.1710	.2020	.0310	.0001	
			c	.2014	.1700	.2012	.0312	.0002	
	5,000	5,000	*a*	.2004	.1683	.2004	.0321	0.	
			b	.2019	.1701	.2019	.0318	0.	
			c	.2012	.1693	.2010	.0317	.0002	
	5,000	10,000	*a*	.2005	.1686	.2006	.0320	−.0001	
			b	.2020	.1705	.2020	.0315	0.	
			c	.2015	.1698	.2013	.0315	.0002	
	40,000	50,000	*a*	.2006	.1692	.2006	.0314	0.	
			b	.2021	.1705	.2020	.0315	.0001	
			c	.2013	.1698	.2013	.0315	0.	
	50,000	100,000	*a*	.2005	.1689	.2006	.0317	−.0001	
			b	.2018	.1704	.2020	.0316	−.0002	
			c	.2013	.1696	.2012	.0316	.0001	
	101,000	201,000	*a*	.2007	.1693	.2006	.0313	.0001	
			b	.2021	.1706	.2019	.0313	.0002	
			c	.2014	.1698	.2011	.0313	.0003	
	99,000	300,000	*a*	.2006	.1693	.2006	.0313	0.	
			b	.2021	.1707	.2021	.0314	0.	
			c	.2014	.1698	.2011	.0313	.0003	
	402,000	702,000	*a*	.2006	.1692	.2006	.0314	0.	
			b	.2021	.1707	.2021	.0314	0.	
			c	.2014	.1694	.2013	.0319	.0001	
	289,000	991,000	.....	.....	.....	.....	.....	.....	Bar ruptured.

No. 192.

COLD-DRAWN STEEL.

Annealed at an estimated temperature of 703° F.
Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Loaded over 4″ length at middle.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2033	.1717	.2032	.0315	.0001	
			b	.2032	.1719	.2034	.0315	—.0002	
			c	.2030	.1715	.2030	.0315	0.	
	5,000	5,000	*a*	.2030	.1715	.2030	.0315	0.	
			b	.2033	.1716	.2034	.0318	—.0001	
			c	.2030	.1715	.2029	.0314	.0001	
	5,000	10,000	*a*	.2031	.1712	.2029	.0317	.0002	
			b	.2033	.1714	.2033	.0319	0.	
			c	.2029	.1714	.2029	.0315	0.	
	100,000	110,000	*a*	.2030	.1714	.2030	.0316	0.	
			b	.2033	.1715	.2031	.0318	0.	
			c	.2030	.1714	.2028	.0314	.0002	
	110,000	220,000	*a*	.2032	.1715	.2032	.0317	0.	
			b	.2034	.1716	.2033	.0317	.0001	
			c	.2031	.1717	.2029	.0312	.0002	
	282,000	502,000	*a*	.2034	.1716	.2033	.0317	.0001	
			b	.2034	.1719	.2033	.0314	.0001	
			c	.2031	.1713	.2029	.0316	.0002	
	304,000	806,000	*a*	.2031	.1714	.2033	.0319	—.0002	
			b	.2034	.1715	.2034	.0319	0.	
			c	.2030	.1715	.2029	.0314	.0001	
	200,000	1,006,000	*a*	.2033	.1714	.2032	.0318	.0001	
			b	.2033	.1714	.2033	.0319	0.	
			c	.2030	.1714	.2029	.0315	.0001	
	339,600	1,345,600	.....	.....	.....	.....	.....	.....	Bar ruptured.

No. 189.

COLD-DRAWN STEEL.

Annealed at an estimated temperature of 889° F.
Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Loaded over 4″ length at middle.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2034	.1714	.2034	.0320	0.	
			b	.2037	.1717	.2036	.0319	.0001	
			c	.2043	.1725	.2043	.0318	0.	
	5,000	5,000	*a*	.2031	.1708	.2031	.0323	0.	
			b	.2035	.1712	.2034	.0322	.0001	
			c	.2043	.1721	.2042	.0321	.0001	
	5,000	10,000	*a*	.2032	.1709	.2032	.0323	0.	
			b	.2034	.1714	.2034	.0320	0.	
			c	.2042	.1720	.2042	.0322	0.	
	44,400	54,400	*a*	.2031	.1710	.2032	.0322	—.0001	
			b	.2034	.1713	.2033	.0320	.0001	
			c	.2042	.1722	.2040	.0318	.0002	
	50,300	104,700	*a*	.2031	.1711	.2034	.0323	—.0003	
			b	.2036	.1713	.2035	.0322	.0001	
			c	.2043	.1722	.2041	.0319	.0002	
	95,300	200,000	*a*	.2036	.1714	.2034	.0320	.0002	
			b	.2037	.1717	.2034	.0317	.0003	
			c	.2042	.1720	.2040	.0320	.0002	
	104,500	304,500	*a*	.2032	.1708	.2030	.0322	.0002	
			b	.2037	.1713	.2033	.0320	.0004	
			c	.2041	.1720	.2038	.0318	.0003	
	98,500	403,000	*a*	.2037	.1715	.2033	.0318	.0004	
			b	.2038	.1719	.2035	.0316	.0003	
			c	.2042	.1722	.2039	.0317	.0003	
	97,000	500,000	*a*	.2042	.1714	.2034	.0320	.0008	
			b	.2040	.1718	.2034	.0316	.0006	
			c	.2043	.1715	.2038	.0323	.0005	
	23,000	523,000	.....	.....	.....	.....	.....	.....	Bar ruptured.

No. 190.

COLD-DRAWN STEEL.

Annealed at an estimated temperature of 904° F.
Diameter, 1′. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Loaded over 4″ length at middle.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2040	.1724	.2039	.0315	.0001	
			b	.2040	.1724	.2039	.0315	.0001	
			c	.2032	.1712	.2029	.0317	.0003	
	5,000	5,000	*a*	.2041	.1725	.2040	.0315	.0001	
			b	.2040	.1722	.2039	.0317	.0001	
			c	.2030	.1711	.2029	.0318	.0001	
	95,000	100,000	*a*	.2040	.1722	.2039	.0317	.0001	
			b	.2041	.1723	.2039	.0316	.0002	
			c	.2030	.1715	.2029	.0314	.0001	
	102,000	202,000	*a*	.2040	.1723	.2040	.0317	0.	
			b	.2042	.1725	.2040	.0315	.0002	
			c	.2032	.1715	.2029	.0314	.0003	
									Run warm; temperature about 120° F.
	303,400	505,400	*a*	.2040	.1715	.2038	.0323	.0002	
			b	.2041	.1719	.2039	.0320	.0002	
			c	.2031	.1709	.2028	.0319	.0003	
	202,600	708,000	.....	.....	.....	.....	.....	.....	Bar ruptured.

No. 195.

COLD-DRAWN STEEL.

Annealed at an estimated temperature of 1,167° F.
Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Loaded over 4″ length at middle.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*nch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2049	.1732	.2049	.0317	0.	
			b	.2061	.1742	.2060	.0318	.0001	
			c	.2063	.1743	.2062	.0319	.0001	
	5,000	5,000	*a*	.2048	.1725	.2048	.0323	0.	
			b	.2060	.1740	.2059	.0319	.0001	
			c	.2061	.1737	.2059	.0322	.0002	
	5,000	10,000	*a*	.2048	.1724	.2048	.0324	0.	
			b	.2059	.1737	.2058	.0321	.0001	Bar runs cool.
			c	.2062	.1738	.2060	.0322	.0002	
	636,300	646,300	.....	.....	.....	.....	.....	.....	Bar ruptured in two places on opposite sides; one about ″.7 from center of north bearing; the other 1″.40 from center of south bearing.

No. 194.

COLD-DRAWN STEEL.

Annealed at an estimated temperature of 1,340° F.
Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Loaded over 4″ length at middle.
Deflection measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2027	.1709	.2024	.0315	.0003	
			b	.2048	.1734	.2045	.0311	.0003	
			c	.2023	.1705	.2022	.0317	.0001	
	5,000	5,000	*a*	.2023	.1705	.2023	.0318	0.	
			b	.2047	.1730	.2045	.0315	.0002	
			c	.2024	.1704	.2021	.0317	.0003	
									Bar run eccentric. Temperature about 125° F.
	5,000	10,000	*a*	.2022	.1699	.2021	.0322	.0001	
			b	.2045	.1724	.2043	.0319	.0002	
			c	.2020	.1699	.2018	.0319	.0002	
	40,600	50,600	*a*	.2021	.1692	.2017	.0325	.0004	
			b	.2042	.1717	.2040	.0323	.0002	
			c	.2020	.1694	.2017	.0323	.0003	
	49,400	100,000	*a*	.2020	.1695	.2019	.0324	.0001	
			b	.2048	.1722	.2041	.0319	.0007	
			c	.2024	.1697	.2019	.0322	.0005	
	406,500	506,500	*a*	.2011	.1693	.2011	.0318	0.	
			b	.2053	.1718	.2038	.0320	.0015	
			c	.2030	.1694	.2015	.0321	.0015	
	35,500	542,000	.....	.....	.....	.....	.....	.....	Bar ruptured.

No. 193.

Cold-Drawn Steel.

Annealed at an estimated temperature of 1,403° F.
Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Loaded over 4″ length at middle.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.2014	.1700	.2012	.0312	.0002	
			b	.2028	.1714	.2026	.0312	.0002	
			c	.2001	.1689	.1998	.0309	.0003	
	5,000	5,000	*a*	.2012	.1694	.2010	.0316	.0002	
			b	.2025	.1710	.2025	.0315	0.	
			c	.1999	.1684	.1996	.0312	.0003	
									Temperature of bar increased to 125° F. Bar runs eccentric.
	5,000	10,000	*a*	.2007	.1689	.2007	.0318	0.	
			b	.2021	.1704	.2023	.0319	—.0002	
			c	.1998	.1679	.1995	.0316	.0003	
	50,000	60,000	*a*	.2011	.1687	.2008	.0321	.0003	
			b	.2026	.1701	.2019	.0318	.0007	
			c	.2001	.1677	.1993	.0316	.0008	
	220,000	280,000	.....	.....	.....	.....	.....	.....	Bar ruptured.

No. 206.

Gautier Steel. Marks, 1 A_1.

Turned down from rod 1¼″ diameter; .15 per cent carbon.
Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Loaded over 4″ length at middle.
Maximum fiber stress, 60,000 pounds per square inch.
At 13,000 rotations temperature in oil pockets 356° F.
After 28,000 rotations rested 1 hour without load.
At 43,000 rotations temperature 356° F.
At 84,800 rotations temperature 374° F.
At 85,200 rotations bar ruptured midway middle bearings.

In beginning the test of this bar the full load was not at once applied. From the start until 1,000 rotations were made the load was gradually increased, after which the bar ran under full load.

This manner of treatment appeared to overcome the initial resistance and avoided the excessive wabbling which has been noticeable where shafts under loads which caused large sets were rotated the first few thousand turns. In the present instance the shaft ran smoothly throughout the test.

No. 209.

GAUTIER STEEL. MARKS, 1 A_2.

Turned down from rod 1¼″ diameter; .15 per cent carbon.
Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Loaded over 4″ length at middle.
Deflections measured on chord of 10″.
Run cold; 90° F. Stream of water played on shaft during test.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
60,000	0	0	*a*	.2000	.1491	.1968	.0477	.0032	
			b	.2015	.1513	.1990	.0477	.0025	
			c	.2012	.1498	.1969	.0471	.0043	
									The fiber stress was between 55,000 and 60,000 per square inch during the first 2,800 rotations.
	4 350	4,350	.....	.....	.....	.....	.....	.....	Bar ruptured at outside end of south middle bearing.

No. 205.

GAUTIER STEEL. MARKS, 2 A_1.

Turned down from rod 1¼″ diameter; .17 per cent carbon.
Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Loaded over 4″ length at middle.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
60,000	0	0	*a*	.1999	.1516	.1983	.0467	.0016	
			b	.2005	.1525	.1994	.0469	.0011	
			c	.2004	.1518	.1990	.0472	.0014	
	9,000	9,000	.....	.....	.....	.....	.....	.....	Temperature in north oil pocket, 426° F.
	18,800	27,800	.....	.....	.....	.....	.....	.....	Temperature in oil pockets, 412° F.
	4,500	32,300	.....	.....	.....	.....	.....	.....	Bar ruptured between middle bearings, 1½″ from center of south middle bearing.

When this test was started there was violent wabbling, and so much resistance against rotating that the load had frequently to be in part removed. After 1,500 rotations the bar ran with less resistance and under the full load.

No. 210.

GAUTIER STEEL. MARKS, 2 A_2.

Turned down from rod 1¼″ diameter; .17 per cent carbon.
Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Loaded over 4″ length at middle.
Deflections measured on chord of 10″.
Run cold. Stream of water played on shaft during test.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
60,000	0	0	*a*	.1996	.1507	.1981	.0474	.0015	
			b	.2003	.1511	.1984	.0473	.0019	
			c	.2007	.1505	.1977	.0472	.0030	
	3,950	3,950	.....	.....	.....	.....	.....	.....	Bar ruptured at outside end of south middle bearing.

This bar acquired a temperature at the middle of 110° F. The water was played on the middle 4″ section, and near by on its length.

From 2″ to 4″ outside of the middle 4″ section the bar acquired a higher temperature, reaching about 130° F. as a maximum.

No. 204.

GAUTIER STEEL. MARKS, 3 A_2.

Turned down from rod $1\frac{1}{4}''$ diameter; .34 per cent carbon.
Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Loaded over 4″ length at middle.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
60,000	0	0	*a*	.1984	.1510	.1981	.0471	.0003	
			b	.1989	.1513	.1981	.0468	.0008	
			c	.1991	.1514	.1985	.0471	.0006	
	6,000	6,000	.....	.....	.....	.....	.....	.....	Temperature, 365° F. at oil pockets.
	4,000	10,000	*a*	.1951	.1398	.1905	.0507	.0046	
			b	.1932	.1396	.1896	.0500	.0036	
			c	.2030	.1455	.1951	.0496	.0079	
	3,500	13,500	.....	.....	.....	.....	.....	.....	Temperature, 342° F. in oil pockets.
	6,500	20,000	.....	.....	.....	.....	.....	.....	Bar rested 3 days, then test resumed.
	20,000	40,000	.....	.....	.....	.....	.....	.....	Temperature, 392° F. in oil pockets.
	10,000	50,000	.....	.....	.....	.....	.....	.....	Temperature, 400° F. in oil pockets.
	37,000	87,000	.....	.....	.....	.....	.....	.....	Temperature, 360° F. in oil pockets.
	17,000	104,000	*a*	.2018	.1426	.1937	.0511	.0081	
			b	.1969	.1444	.1941	.0497	.0028	
			c	.2022	.1456	.1946	.0490	.0076	
									Rested 1 hour, the temperature falling to about 100° F.
	0	104,000	*a*	.2009	.1498	.1971	.0473	.0038	
			b	.2004	.1498	.1969	.0471	.0035	
			c	.1997	.1488	.1959	.0471	.0038	
	23,700	127,700	.....	.....	.....	.....	.....	.....	Bar ruptured at north middle bearing.

No. 211.

GAUTIER STEEL. MARKS, 3 A_1.

Turned down from rod $1\frac{1}{4}''$ diameter; .34 per cent carbon.
Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Loaded over 4″ length at middle.
Deflections measured on chord of 10″.
Run cold. Stream of water played on shaft during test.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
60,000	0	0	*a*	.1997	.1525	.1994	.0469	.0003	
			b	.2000	.1520	.1995	.0475	.0005	
			c	.2018	.1528	.1997	.0469	.0021	
									Bar rested 10 days without load.
	5,000	5,000	*a*	.2038	.1324	.1815	.0491	.0223	Temperature at bearings about 110° F.
			b	.1973	.1288	.1776	.0488	.0197	
			c	.2253	.1392	.1880	.0488	.0373	
	5,000	10,000	*a*	.1734	.1174	.1670	.0496	.0064	Temperature at bearings about 105° F.
			b	.2239	.1357	.1848	.0491	.0391	
			c	.2230	.1370	.1868	.0498	.0362	
									Bar rested 16 hours without load.
	0	10,000	*a*	.2087	.1360	.1837	.0477	.0250	
			b	.2174	.1395	.1886	.0491	.0288	
			c	.2122	.1375	.1870	.0495	.0252	
			a	.2105	.1342	.1835	.0493	.0270	Readings repeated.
	1,600	11,600	.....	.....	.....	.....	.....	.....	Bar ruptured at center of south middle bearing.

No. 208.

GAUTIER STEEL. MARKS, 5 A_2.

Turned down from rod 1¼″ diameter; .55 per cent carbon.
Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Loaded over 4″ length at middle.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
60,000	0	0	*a*	.1997	.1518	.1994	.0476	.0003	
			b	.1997	.1517	.1995	.0478	.0002	
			c	.2003	.1521	.2000	.0479	.0003	
	5,000	5,000	*a*	.1895	.1380	.1894	.0514	.0001	Temperature in oil pockets, 330° F.
			b	.1961	.1399	.1904	.0505	.0057	
			c	.2116	.1508	.2010	.0502	.0106	
	15,000	20,000	*a*	.1871	.1357	.1871	.0514	0.	Temperature, 318° F.
			b	.2004	.1404	.1915	.0511	.0089	
			c	.2112	.1482	.1990	.0508	.0122	
	57,000	77,000	.....	.....	.....	.....	.....	.....	Rested 1 hour unloaded.
	23,000	100,000	*a*	.1929	.1405	.1915	.0510	.0014	Temperature, 325° F.
			b	.1945	.1398	.1902	.0504	.0043	
			c	.2093	.1507	.2009	.0502	.0084	
	11,800	111,800	.....	.....	.....	.....	.....	.....	Bar ruptured ¼″ outside north middle bearing.

No. 207.

GAUTIER STEEL. MARKS, 5 A_1.

Turned down from rod 1¼″ diameter; .55 per cent carbon.
Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Loaded over 4″ length at middle.
Deflections measured on chord of 10″.
Run cold. Stream of water played on shaft during test.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
60,000	0	0	*a*	.2000	.1523	.1997	.0474	.0003	
			b	.2000	.1520	.1995	.0475	.0005	
			c	.2002	.1523	.1998	.0475	.0004	
	5,000	5,000	*a*	.2235	.1328	.1868	.0540	.0367	
			b	.1899	.1214	.1733	.0519	.0166	
			c	.2206	.1331	.1841	.0510	.0365	
	6,950	11,950	.....	.....	.....	.....	.....	.....	Bar ruptured at outer end of south bearing.

No. 198.

GAUTIER STEEL. MARKS, 7 A_1.

Turned down from rod 1¼″ diameter; .73 per cent carbon.
Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Loaded over 4″ length at middle.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
60,000	0	0	*a*	.1997	.1534	.1994	.0460	.0003	
			b	.1995	.1530	.1993	.0463	.0002	
				.1995	.1527	.1992	.0465	.0003	
									At 2,000 rotations the bar reached a temperature of about 140° F., and when unloaded wabbled violently. Rested over night, and upon resuming the test acquired a temperature of about 220° F. at the conclusion of 6,000 rotations.
	6,000	6,000	*a*	.1970	.1483	.1962	.0479	.0008	Measurements taken while hot.
			b	.1916	.1416	.1895	.0479	.0021	
			c	.2090	.1564	.2043	.0479	.0047	
	4,000	10,000	*a*	.2085	.1520	.2010	.0490	.0075	Temperature, about 275° F.
			b	.1976	.1460	.1955	.0495	.0021	Oil smoked.
			c	.1982	.1475	.1959	.0484	.0023	
									At 20,000 rotations the bar had acquired a blue color.
	30,000	40,000	*a*	.1962	.1453	.1952	.0499	.0010	
			b	.2044	.1513	.2000	.0487	.0044	
			c	.1995	.1480	.1970	.0480	.0025	
									At 125,000 rotations thermometer held in oil pocket of middle bearing registers 332° F. Maximum observed.
	85,000	125,000	*a*	.2013	.1481	.1977	.0496	.0036	
			b	.1976	.1474	.1965	.0491	.0011	
			c	.2010	.1503	.1995	.0492	.0015	
									At 134 rotations temperature 365° F.
	24,000	149,000	*a*	.2015	.1478	.1971	.0493	.0044	Temperature, 304° F.
			b	.2015	.1498	.1987	.0489	.0028	
			c	.1991	.1478	.1968	.0490	.0023	
									After resting 15 hours, temperature 80° F.
	0	149,000	*a*	.2005	.1504	.1980	.0476	.0025	
			b	.2011	.1510	.1990	.0480	.0021	
			c	.1995	.1490	.1973	.0483	.0022	
									Rotating resumed without wabbling of shaft. At 160,000 rotations the temperature, as shown by thermometer placed in oil pocket of middle bearing, was 202° F.

No. 198—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
60,000	69,500	218,500	.....	.....	.....	.....	.....	.....	Bar ruptured ¾" inside the 4" middle bearing. The fractured surface was fine granular with very slight battered-down appearance. This surface was not colored by the heat of the specimen. At the time of rupture oil smoked at the middle bearing and the temperature of the bar was in the vicinity of 300° F.

No. 199.

GAUTIER STEEL. MARKS, 7 A_2.

Turned down from rod $1\frac{1}{4}''$ diameter; .73 per cent carbon.
Diameter, $1''$. Speed of rotation, 400 per minute.
Length between end bearings, $33''$.
Loaded over $4''$ length at middle.
Deflections measured on chord of $10''$.
Shaft run cold. A stream of cold water at 74° F. played on the shaft during the test.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
60,000	0	0	*a*	.2005	.1533	.2005	.0472	0.	
			b	.2007	.1533	.2005	.0472	.0002	
			c	.2004	.1528	.2001	.0473	.0003	
									Bar reached the temperature of about 105° F. while running.
	6,000	6,000	*a*	.1977	.1469	.1956	.0487	.0021	
			b	.2055	.1481	.1970	.0489	.0065	
			c	.2030	.1474	.1965	.0491	.0065	
	7,300	13,300	*a*	.1957	.1455	.1948	.0493	.0009	
			b	.1995	.1460	.1953	.0493	.0042	
			c	.2058	.1470	.1966	.0496	.0092	
	21,600	34,900	.....	.....	.....	.....	.....	.....	Bar ruptured at outside edge of north center bearing; medium coarse granular, with dull leaden appearance, penetrating an average depth of $\frac{1}{4}''$ from the circumference. There were two small circular cracks in the immediate vicinity of the fractured surface. The maximum temperature reached by the shaft during running was about 110° F.

No. 200.

GAUTIER STEEL. MARKS, 9 A_1.

Turned down from rod $1\frac{1}{4}''$ diameter; .82 per cent carbon.
Diameter, $1''$. Speed of rotation, 400 per minute.
Length between end bearings, $33''$.
Loaded over $4''$ length at middle.
Deflections measured on chord of $10''$.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
60,000	0	0	*a*	.1992	.1515	.1990	.0475	.0002	
			b	.1990	.1518	.1988	.0470	.0002	
			c	.1991	.1520	.1988	.0468	.0003	
									After 800 rotations the box was too hot to bear the hand.
	2,000	2,000	*a*	.2071	.1464	.1955	.0491	.0116	
			b	.2049	.1478	.1968	.0490	.0081	
			c	.1993	.1434	.1925	.0491	.0068	
	2,000	4,000	*a*	.2081	.1485	.1978	.0493	.0103	
			b	.2053	.1493	.1987	.0494	.0066	
			c	.1967	.1419	.1906	.0487	.0061	
	14,800	18,800	.....	.....	.....	.....	.....	.....	Temperature of bar, 315° F., as shown by thermometer in oil pocket.
	1,200	20,000	*a*	.2021	.1474	.1967	.0493	.0054	
			b	.1970	.1456	.1949	.0493	.0021	
			c	.2014	.1490	.1981	.0491	.0033	
	54,500	74,500	*a*	.2040	.1450	.1958	.0508	.0082	Temperature of bar 246° F.
			b	.2025	.1466	.1966	.0500	.0059	
			c	.2000	.1448	.1948	.0500	.0052	Rested 15 hours, then 1,200 rotations and measured.
	1,200	75,700	*a*	.2003	.1464	.1952	.0488	.0051	Temperature about 110° F.
			b	.1995	.1460	.1954	.0494	.0041	
			c	.2026	.1463	.1956	.0493	.0070	
	19,300	95,000	.....	.....	.....	.....	.....	.....	Temperature in oil pocket, 346° F.
	45,000	140,000	.....	.....	.....	.....	.....	.....	Temperature, 314° F. The rotations have been continuous since the last observation.
	8,200	148,200	.....	.....	.....	.....	.....	.....	Bar ruptured under south section of middle bearing.

No. 201.

GAUTIER STEEL. MARKS, 9 A_2.

Turned down from rod $1\frac{1}{4}''$ diameter; .82 per cent carbon.
Diameter, $1''$. Speed of rotation, 400 per minute.
Length between end bearings, $33''$.
Loaded over $4''$ length at middle.
Deflections measured on chord of $10''$.
Run cold. Stream of water played on shaft during test.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
60,000	0	0	*a*	.1994	.1524	.1991	.0467	.0003	
			b	.1993	.1511	.1990	.0479	.0003	
			c	.1996	.1522	.1993	.0471	.0003	
	0	0	*a*	.1996	.1518	.1993	.0475	.0003	
			b	.1994	.1524	.1992	.0468	.0002	
			c	.1994	.1521	.1992	.0471	.0002	
	4,000	4,000	*a*	.1965	.1445	.1933	.0488	.0032	Temperature, 100° F.
			b	.2055	.1450	.1953	.0494	.0102	
			c	.2027	.1456	.1952	.0494	.0075	
	16,000	20,000	*a*	.1980	.1436	.1929	.0493	.0051	
			b	.1976	.1425	.1925	.0500	.0051	
			c	.2065	.1458	.1955	.0497	.0110	
	22,000	42,000	.....	.....	.....	.....	.....	.....	Bar ruptured in south middle bearing.

No. 202.

GAUTIER STEEL. MARKS, 11 A_1.

Turned down from rod 1¼″ diameter; 1.09 per cent carbon.
Diameter, 1″. Speed of rotation, 400 per minute.
Length between end bearings, 33″.
Loaded over 4″ length at middle.
Deflections measured on chord of 10″.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
60,000	0	0	*a*	.2001	.1528	.1999	.0471	.0002	
			b	.2004	.1531	.2000	.0469	.0004	
			c	.2000	.1528	.1998	.0470	.0002	
	2,000	2,000	*a*	.1956	.1362	.1842	.0480	.0114	Temperature about 220° F.
			b	.2287	.1574	.2067	.0493	.0220	
			c	.1950	.1325	.1818	.0493	.0132	
			a	.2015	.1387	.1878	.0491	.0137	Readings repeated on line *a*.
	,500	11,500	.....	.....	.....	.....	.....	.....	Temperature in oil pocket 472° F.
	13,900	25,400	.....	.....	.....	.....	.....	.....	At this time the temperature of bar had fallen to 374° F.
	600	26,000	*a*	.1938	.1449	.1940	.0491	.0002	
			b	.2018	.1508	.1994	.0486	.0024	
			c	.2030	.1521	.2006	.0485	.0024	
	51,000	77,000	.....	.....	.....	.....	.....	.....	Temperature, 246° F.
	2,000	79,000	*a*	.1960	.1453	.1942	.0489	.0018	
			b	.1960	.1459	.1947	.0488	.0013	
			c	.2070	.1507	.2000	.0493	.0070	
	14,000	93,000	.....	.....	.....	.....	.....	.....	Temperature, 336° F.
	6,200	99,200	.....	.....	.....	.....	.....	.....	Bar ruptured about 3½″ outside of south middle bearing at fine line scored in surface defining the limits of the gauged section.

No. 203.

GAUTIER STEEL. MARKS, 11 A_2.

Turned down from rod $1\frac{1}{4}''$ diameter; 1.09 per cent carbon.
Diameter, $1''$. Speed of rotation, 400 per minute.
Length between end bearings, $33''$.
Loaded over $4''$ length at middle.
Deflections measured on chord of $10''$.
Run cold. Stream of water played on shaft during test.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
60,000	0	0	*a*	.1990	.1524	.1987	.0463	.0003	
			b	.1989	.1518	.1985	.0467	.0004	
			c	.1990	.1520	.1987	.0467	.0003	
	20,000	20,000	*a*	.1927	.1307	.1820	.0513	.0007	
			b	.1925	.1271	.1821	.0550	.0104	
			c	.2205	.1381	.1898	.0517	.0307	
	3,000	23,000	...	.....	.....	.....	.....	.....	Bar ruptured.

ENDURANCE OF ROTATING SHAFTS.

SUMMARIZED TABULATION.

SHAFTS LOADED ON SINGLE BEARING AT MIDDLE.

No. of test.	Material.	Annealing temperature.	Speed of rotation per minute.	Maximum fiber stress per square inch.	Total number of rotations.	Remarks.
		Deg. F.		*Pounds.*		
176	Cold-rolled steel		400	35,000	1,560,310	Bar ruptured.
177	do		400	35,000	3,829,400	Bar ruptured 2″ from middle bearing.
178	do		400	35,000	7,598,540	Bar ruptured.
185	do	1,783	400	40,000	238,880	Bar ruptured 3″ from center at a small drilled hole defining the gauge section in determining the annealing temperature.
170	do			45,000	152,580	Bar ruptured.
171	do			45,000	151,000	Do.
172	do			45,000	50,200	Test discontinued.
173	do			45,000	50,000	Do.
174	do			45,000	50,000	Do.
175	do			45,000	50,000	Do.
161	do			55,000	103,340	Bar ruptured.
162	do			55,000	52,400	Do.
163	do			55,000	77,500	Do.
165	do			55,000	48,100	Do.
164	do			55,000	50,000	Test discontinued.
166	do			55,000	50,000	Do.
167	do			55,000	50,000	Do.
168	do			55,000	50,000	Do.
169	do			55,000	50,000	Do.
160	Cold-drawn steel		400	35,000	700,000	Do.
155	do		400	40,000	1,112,140	Bar ruptured.
156	do		400	40,000	708,300	Do.
157	do		400	40,000	485,260	Do.
158	do		400	40,000	372,370	Do.
159	do		400	40,000	465,120	Do.
188	do		400	40,000	563,700	Do.
153	do		400	45,000	354,450	Do.
154	do		400	45,000	283,550	Do.
149	do		400	50,000	104,100	Do.
150	do		400	50,000	97,000	Do.
151	do		400	55,000	57,300	Do.
152	do		400	55,000	40,400	Do.

SHAFTS LOADED ON DOUBLE BEARING, 4″ CENTER TO CENTER AT MIDDLE.

179	Cold-rolled steel		400	40,000	857,400	Bar ruptured at one extremity of 4″ loaded section.
181	do	645	400	40,000	234,000	Bar ruptured 1″ outside the 4″ loaded section at a drilled hole defining gauged length in determining the annealing temperature.
180	do	1,032	400	40,000	211,000	Do.
183	do	1,370	400	40,000	194,000	Do.
184	do	1,375	400	40,000	243,200	Load changed to single bearing after 5,000 rotations. Bar ruptured at middle under single ring bearing.
182	do	1,800	400	40,000	102,000	Bar ruptured 1″ outside the 4″ loaded section at a drilled hole defining gauged length in determining the annealing temperature.
186	Cold-drawn steel		400	40,000	838,200	Bar ruptured 1″ inside the 4″ loaded section.
187	do		400	40,000	604,000	Test discontinued.
197	do	454	400	40,000	1,249,800	Bar ruptured between middle bearings.
196	do	552	400	40,000	2,315,500	Bar ruptured about midway between the end bearings.

Summarized tabulation—Continued.

SHAFTS LOADED ON DOUBLE BEARING, 4" CENTER TO CENTER AT MIDDLE—Cont'd.

No. of test.	Material.	Annealing temperature.	Speed of rotation per minute.	Maximum fiber stress per square inch.	Total number of rotations.	Remarks.
		Deg. F.		*Pounds.*		
191	Cold-drawn steel	673	400	40,000	991,000	Bar ruptured.
192	.....do	703	400	40,000	1,345,600	Do.
189	.....do	889	400	40,000	523,000	Do.
190	.....do	904	400	40,000	708,000	Do.
195	.....do	1,167	400	40,000	646,300	Bar ruptured in two places on opposite sides, one about ".7 from center of north bearing, the other 1".40 from center of south bearing.
194	.....do	1,340	400	40,000	542,000	Bar ruptured.
193	.... do	1,403	400	40,000	280,000	Do.

STEEL BARS OF DIFFERENT CARBONS RUN AT DIFFERENT TEMPERATURES.

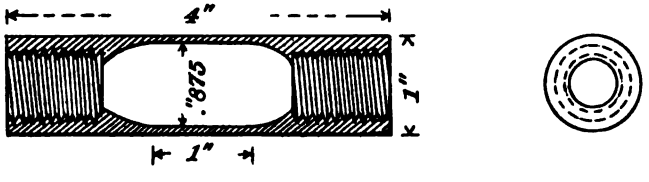
No. of test.	Material.	Maximum temperature of test.	Speed of rotation per minute.	Maximum fiber stress per square inch.	Total number of rotations.	Remarks.
		Deg. F.		*Pounds.*		
206	Gautier steel, .15 c....	374	400	60,000	85,200	Bar ruptured midway middle bearings.
209	.....do	90	400	60,000	4,350	Bar ruptured at outside end of south middle bearing.
205	Gautier steel, .17 c....	426	400	60,000	32,300	Bar ruptured between middle bearings.
210	.....do	110	400	60,000	3,950	Bar ruptured at outside end of middle bearing.
204	Gautier steel, .34 c....	400	400	60,000	127,700	Bar ruptured at north middle bearing.
211	.....do	110	400	60,000	11,600	Bar ruptured at south middle bearing.
208	Gautier steel, .55 c....	330	400	60,000	111,800	Bar ruptured $\frac{1}{4}$" outside north middle bearing.
207	.....do	74	400	60,000	11,950	Bar ruptured at outer end of south bearing.
198	Gautier steel, .73 c....	365	400	60,000	218,500	Bar ruptured $\frac{3}{8}$" inside the 4" middle bearing.
199	.....do	110	400	60,000	34,900	Bar ruptured at outside end of north middle bearing.
200	Gautier steel, .82 c....	346	400	60,000	148,200	Bar ruptured under south middle bearing.
201	.....do	100	400	60,000	42,000	Bar ruptured in south middle bearing.
202	Gautier steel, 1.09 c...	472	400	60,000	99,200	Bar ruptured about $3\frac{1}{2}$" outside of the south middle bearing.
203	.....do	74	400	60,000	23,000	Bar ruptured.

ANNULAR TENSION SPECIMENS

FROM

UNRUPTURED AND RUPTURED ENDURANCE SHAFTS.

Form of specimens.



SPECIMENS FROM UNRUPTURED SHAFTS.

No. 5027.

COLD-ROLLED STEEL.

Annular specimen from outer end of endurance shaft No. 164.
Diameters, { exterior, ″.9982.
interior, ″.887.
Sectional area, .164 square inch.
Gauged length, 1″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
164	1,000	0.	0.	Initial load.
820	5,000	0.	.....	
1,640	10,000	.0001	.....	
2,460	15,000	.0003	.....	
3,280	20,000	.0005	.....	
4,100	25,000	.0006	.....	
4,920	30,000	.0007	.....	
5,740	35,000	.0009	.....	
6,560	40,000	.0010	.....	
7,380	45,000	.0012	.....	
8,200	50,000	.0013	.....	
9,020	55,000	.0015	.....	
9,512	58,000	.....	.....	Elastic limit, approximate.
9,840	60,000	.0021	.....	
10,168	62,000	.0046	.....	
10,496	64,000	.0070	.....	
10,824	66,000	.0108	.....	
11,152	68,000	.0138	.....	
11,480	70,000	.0197	.....	
11,808	72,000	.0248	.....	
12,136	74,000	.0335	.....	
12,464	76,000	.0450	.....	
12,792	78,000	.0730	.....	
12,810	78,110	.....	.....	Tensile strength.
0	0	.16	.....	= 16 per cent.

Exterior diameter, ″.88 = ″.1182 reduction.
Appearance of fracture, silky.
NOTE.—Specimens Nos. 5027 to 5041, inclusive, were bored out cylindrically a length of $\frac{1}{2}$″; all subsequent specimens were bored cylindrically 1″ long, interior diameter.

No. 5028.

Cold-Rolled Steel.

Annular specimen from middle section of endurance shaft No. 164.
Diameters, { exterior, ″.9990.
interior, ″.886.
Sectional area, .167 square inch.
Gauged length, 1″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
167	1,000	0.	0.	Initial load.
835	5,000	.0002	.....	
1,670	10,000	.0003	.....	
2,505	15,000	.0004	.....	
3,340	20,000	.0006	.....	
4,175	25,000	.0008	.....	
5,010	30,000	.0009	.....	
5,845	35,000	.0011	.....	
6,680	40,000	.0013	.....	
7,515	45,000	.0015	.....	
8,350	50,000	.0019	.....	
8,684	52,000	.0021	.....	
9,018	54,000	.0023	.....	Elastic limit.
9,352	56,000	.0028	.....	
9,686	58,000	.0032	.....	
10,020	60,000	.0042	.....	
10,354	62,000	.0051	.....	
10,688	64,000	.0069	.....	
11,022	66,000	.0086	.....	
11,356	68,000	.0112	.....	
11,690	70,000	.0150	.....	
12,024	72,000	.0190	.....	
12,358	74,000	.0260	.....	
12,692	76,000	.0315	.....	
13,026	78,000	.0443	.....	Tensile strength.
0	0	.11	.....	=11 per cent.

Exterior diameter, ″.92 = ″.0790 reduction.

Appearance of fracture, silky. The exterior surface of the specimen in the vicinity of the place of rupture was thickly studded with small cracks, which opened during the continuance of the test.

No. 5029.

COLD-ROLLED STEEL.

Annular specimen from outer end of endurance shaft No. 166.
Diameters, { exterior, ″.999.
interior, ″.874.
Sectional area, .184 square inch.
Gauged length, 1″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
184	1,000	0.	0.	Initial load.
920	5,000	.0001	.....	
1,840	10,000	.0003	.....	
2,760	15,000	.0006	.....	
3,680	20,000	.0007	.....	
4,600	25,000	.0009	.....	
5,520	30,000	.0010	.....	
6,440	35,000	.0011	.....	
7,360	40,000	.0013	.....	
8,280	45,000	.0015	.....	
9,200	50,000	.0016	.....	
9,568	52,000	.0017	.....	
9,936	54,000	.0018	.....	
10,304	56,000	.0018	.....	
10,672	58,000	.0019	.....	
11,040	60,000	.0020	.....	Elastic limit.
11,408	62,000	.0026	.....	
11,776	64,000	.0066	.....	
12,144	66,000	.0080	.....	
12,512	68,000	.0116	.....	
12,880	70,000	.0170	.....	
13,248	72,000	.0215	.....	
13,616	74,000	.0290	.....	
13,984	76,000	.0420	.....	
14,352	78,000	.0538	.....	
14,720	80,000	.0900	.....	
14,760	80,220	.....	.....	Tensile strength.
0	0	.24	.....	= 24 per cent.

Exterior diameter, ″.86 = ″.139 reduction.
Appearance of fracture, silky.

No. 5030.

COLD-ROLLED STEEL.

Annular specimen from middle section of endurance shaft No. 106.
Diameters, { exterior, ".999. interior, ".874.
Sectional area, .184 square inch.
Gauged length, 1."

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
184	1,000	0.	0.	Initial load.
920	5,000	.0001	.....	
1,840	10,000	.0003	.....	
2,760	15,000	.0005	.....	
3,680	20,000	.0007	.....	
4,600	25,000	.0008	.....	
5,520	30,000	.0009	.....	
6,440	35,000	.0011	.....	
7,360	40,000	.0012	.....	
8,280	45,000	.0014	.....	
9,200	50,000	.0017	.....	
9,568	52,000	.0019	.....	Elastic limit.
9,936	54,000	.0025	.....	
10,304	56,000	.0033	.....	
10,672	58,000	.0048	.....	
11,040	60,000	.0089	.....	Tensile strength.
0	0	.04	.....	=4 per cent.

Exterior diameter, ".98=".019 reduction.

Appearance of fracture, 50 per cent of surface silky, 50 per cent in irregular patches granular. The granular patches had a dark-colored appearance. From their general appearance it was uncertain whether the granular patches existed as cracked spots prior to the tensile test or were developed during this test.

No. 5031.

COLD-ROLLED STEEL.

Annular specimen from outer end of endurance shaft No. 167.
Diameters, { exterior, ″.999.
interior, ″.875.
Sectional area, .182 square inch.
Gauged length, 1″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
182	1,000	0.	0.	Initial load.
910	5,000	.0001	.....	
1,820	10,000	.0003	.....	
2,730	15,000	.0005	.....	
3,640	20,000	.0007	.....	
4,550	25,000	.0009	.....	
5,460	30,000	.0010	.....	
6,370	35,000	.0011	.....	
7,280	40,000	.0013	.....	
8,190	45,000	.0015	.....	
9,100	50,000	.0017	.....	
9,464	52,000	.0017	.....	
9,828	54,000	.0018	.....	
10,192	56,000	.0018	.....	
10,556	58,000	.0019	.....	
10,920	60,000	.0020	.....	Elastic limit.
11,284	62,000	.0030	.....	
11,648	64,000	.0050	.....	
12,012	66,000	.0075	.....	
12,376	68,000	.0111	.....	
12,740	70,000	.0150	.....	
13,104	72,000	.0201	.....	
13,468	74,000	.0265	.....	
13,832	76,000	.0375	.....	
14,196	78,000	.0505	.....	
14,560	80,000	.0750	.....	
14,600	80,220	.....	.....	Tensile strength.
0	0	.23	.....	=23 per cent.

Exterior diameter, ″.85=″.149 reduction.
Appearance of fracture, silky.

No. 5031*a*.

COLD-ROLLED STEEL.

Annular specimen from middle section of endurance shaft No. 167.
Diameters, { exterior, ″.999.
interior, ″.875.
Sectional area, .182 square inch.
Gauged length, 1″.

A fine crack existed at the middle of this specimen, one which had developed during the endurance test.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
182	1,000	0.	0.	Initial load.
910	5,000	.0001	.....	
1,820	10,000	.0004	.....	
2,730	15,000	.0007	.....	
3,640	20,000	.0012	.....	
4,550	25,000	.0016	.....	
5,460	30,000	.0021	.....	
6,370	35,000	.0038	.....	
7,280	40,000	.0135	.....	Tensile strength.
0	0	.02	.....	= 2 per cent.

Exterior diameter, ″.98=″.019 reduction.

Appearance of fracture, granular 60 per cent, silky 40 per cent. The granular parts evidently represented the metal which had been ruptured during the endurance test.

No. 5032.

COLD-ROLLED STEEL.

Annular specimen from outer end of endurance shaft No. 169.
Diameters, { exterior, ″.999.
interior, ″.862.
Sectional area, .200 square inch.
Gauged length, 1″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	Initial load.
1,000	5,000	.0002	.....	
2,000	10,000	.0003	.....	
3,000	15,000	.0004	.....	
4,000	20,000	.0006	.....	
5,000	25,000	.0009	.....	
6,000	30,000	.0010	.....	
7,000	35,000	.0011	.....	
8,000	40,000	.0012	.....	
9,000	45,000	.0014	.....	
10,000	50,000	.0016	.....	
10,400	52,000	.0017	.....	
10,800	54,000	.0018	.....	
11,200	56,000	.0019	.....	
11,600	58,000	.0019	.....	Elastic limit.
12,000	60,000	.0024	.....	
12,400	62,000	.0060	.....	
12,800	64,000	.0080	.....	
13,200	66,000	.0123	.....	
13,600	68,000	.0170	.....	
14,000	70,000	.0210	.....	
14,400	72,000	.0275	.....	
14,800	74,000	.0355	.....	
15,200	76,000	.0470	.....	
15,600	78,000	.0670	.....	
15,800	79,000	.0995	.....	
15,910	79,550	.....	.....	Tensile strength.
0	0	.24	.....	= 24 per cent.

Exterior diameter, ″.84 = ″.159 reduction.
Appearance of fracture, silky.

No. 5033.

COLD-ROLLED STEEL.

Annular specimen from middle section of endurance shaft No. 169.
Diameters, { exterior, ″.999.
interior, ″.877.
Sectional area, .180 square inch.
Gauged length, 1″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
180	1,000	0.	0.	Initial load.
900	5,000	0.	.....	
1,800	10,000	.0002	.....	
2,700	15,000	.0004	.....	
3,600	20,000	.0006	.....	
4,500	25,000	.0008	.....	
5,400	30,000	.0010	.....	
6,300	35,000	.0011	.....	
7,200	40,000	.0012	.....	
8,100	45,000	.0015	.....	
9,000	50,000	.0018	.....	
9,360	52,000	.0019	.....	
9,720	54,000	.0021	.....	
10,080	56,000	.0023	.....	Elastic limit.
10,440	58,000	.0029	.....	
10,800	60,000	.0048	.....	
11,160	62,000	.0060	.....	
11,520	64,000	.0095	.....	
11,880	66,000	.0131	.....	
12,240	68,000	.0166	.....	
12,600	70,000	.0245	.....	Tensile strength.
0	0	.08	.....	= 8 per cent.

Exterior diameter ″.96 = ″.039 reduction.

Fractured in detail, the metal first opening along an irregular circumferential crack.

About 10 per cent of the fractured surface appeared to have been fractured during the endurance test; 90 per cent was silky, and was the part fractured by the present test.

No. 5034.

COLD-ROLLED STEEL.

Annular specimen from outer end of endurance shaft No. 172.
Diameters, { exterior, ″.999.
interior, ″.876.
Sectional area, .181 square inch.
Gauged length, 1″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
181	1,000	0.	0.	Initial load.
905	5,000	.0002	.....	
1,810	10,000	.0003	.....	
2,715	15,000	.0005	.....	
3,620	20,000	.0007	.....	
4,525	25,000	.0009	.....	
5,430	30,000	.0011	.....	
6,335	35,000	.0012	.....	
7,240	40,000	.0013	.....	
8,145	45,000	.0015	.....	
9,050	50,000	.0017	.....	
9,412	52,000	.0018	.....	
9,774	54,000	.0019	.....	
10,136	56,000	.0019	.....	
10,498	58,000	.0021	.....	
10,679	59,000	.0022	.....	Elastic limit.
10,860	60,000	.0087	.....	
11,222	62,000	.0130	.....	
11,584	64,000	.0182	.....	
11,946	66,000	.0235	.....	
12,308	68,000	.0310	.....	
12,670	70,000	.0410	.....	
13,032	72,000	.0540	.....	
13,394	74,000	.0760	.....	
13,620	75,250	.1470	.....	Tensile strength.
0	0	.26	.....	= 26 per cent.

Exterior diameter, ″.83 = ″.169 reduction.
Appearance of fracture, silky.

No. 5035.

COLD-ROLLED STEEL.

Annular specimen from middle section of endurance shaft No. 172.
Diameters, { exterior, ″.999.
interior, ″.869.
Sectional area, .191 square inch.
Gauged length, 1″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
191	1,000	0.	0.	Initial load.
955	5,000	.0001	.....	
1,910	10,000	.0003	.....	
2,865	15,000	.0005	.....	
3,820	20,000	.0007	.....	
4,775	25,000	.0008	.....	
5,730	30,000	.0009	.....	
6,685	35,000	.0011	.....	
7,640	40,000	.0013	.....	
8,595	45,000	.0015	.....	
9,550	50,000	.0017	.....	
9,932	52,000	.0018	.....	
10,314	54,000	.0019	.....	
10,696	56,000	.0019	.....	
11,078	58,000	.0021	.....	
11,269	59,000	.....	.....	Elastic limit.
11,460	60,000	.0027	.....	
11,842	62,000	.0059	.....	
12,224	64,000	.0096	.....	
12,606	66,000	.0143	.....	
12,988	68,000	.0196	.....	
13,370	70,000	.0248	.....	
13,752	72,000	.0310	.....	
14,134	74,000	.0400	.....	
14,516	76,000	.0570	.....	
14,898	78,000	.0940	.....	Tensile strength.
0	0	.27	.....	= 27 per cent.

Exterior diameter, ″.83 = ″.169 reduction.
Appearance of fracture, silky.

No. 5036.

COLD-ROLLED STEEL.

Annular specimen from outer end of endurance shaft No. 173.
Diameters, { exterior, ″.998. interior, ″.869.
Sectional area, .189 square inch.
Gauged length, 1″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
189	1,000	0.	0.	Initial load.
945	5,000	.0001	.....	
1,890	10,000	.0003	.....	
2,835	15,000	.0005	.....	
3,780	20,000	.0006	.....	
4,725	25,000	.0008	.....	
5,670	30,000	.0009	.....	
6,615	35,000	.0011	.....	
7,560	40,000	.0012	.....	
8,505	45,090	.0013	.....	
9,450	50,000	.0015	.....	
9,828	52,006	.0017	.....	
10,206	54,000	.0017	.....	
10,584	56,000	.0018	.....	
10,962	58,000	.0019	.....	
11,340	60,000	.0020	.....	Elastic limit.
11,718	62,000	.0031	.....	
12,096	64,000	.0080	.....	
12,474	66,000	.0115	.....	
12,852	68,000	.0158	.....	
13,230	70,000	.0203	.....	
13,608	72,000	.0260	.....	
13,986	74,000	.0346	.....	
14,364	76,000	.0470	.....	
14,742	78,000	.0650	.....	
15,060	79,680	.1370	.....	Tensile strength.
0	0	.26	.....	= 26 per cent.

Exterior diameter, ″.83 = ″.168 reduction.
Appearance of fracture, silky.

No. 5037.

COLD-ROLLED STEEL.

Annular specimen from middle section of endurance shaft No. 173.
Diameters, { exterior, ″.999.
interior, ″.870.
Sectional area, .189 square inch.
Gauged length, 1″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
189	1,000	0.	0.	Initial load.
945	5,000	.0001	.....	
1,890	10,000	.0003	.....	
2,835	15,000	.0005	.....	
3,780	20,000	.0007	.....	
4,725	25,000	.0008	.....	
5,670	30,000	.0010	.....	
6,615	35,000	.0011	.....	
7,560	40,000	.0013	.....	
8,505	45,000	.0015	.....	
9,450	50,000	.0017	.....	
9,828	52,000	.0018	.....	
10,206	54,000	.0019	.....	
10,584	56,000	.0019	.....	
10,962	58,000	.0020	.....	
11,340	60,000	.0021	.....	Elastic limit.
11,718	62,000	.0026	.....	
12,096	64,000	.0060	.....	
12,474	66,000	.0112	.....	
12,852	68,000	.0162	.....	
13,230	70,000	.0230	.....	
13,608	72,000	.0300	.....	
13,986	74,000	.0400	.....	
14,364	76,000	.0540	.....	
14,742	78,000	.0770	.....	
14,830	78,470	.1100	.....	Tensile strength.
0	0	.29	.....	=29 per cent.

Exterior diameter, ″.81=″.189 reduction.
Appearance, silky.

No. 5038.

COLD-ROLLED STEEL.

Annular specimen from outer end of endurance shaft No. 174.
Diameters, { exterior, ″.998.
interior, ″.867.
Sectional area, .192 square inch.
Gauged length, 1″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
192	1,000	0.	0.	Initial load.
960	5,000	.0001	.....	
1,920	10,000	.0002	.....	
2,880	15,000	.0004	.....	
3,840	20,000	.0006	.....	
4,800	25,000	.0008	.....	
5,760	30,000	.0010	.....	
6,720	35,000	.0011	.....	
7,680	40,000	.0012	.....	
8,640	45,000	.0015	.....	
9,600	50,000	.0017	.....	
9,984	52,000	.0018	.....	
10,368	54,000	.0018	.....	
10,752	56,000	.0019	.....	
11,136	58,000	.0020	.....	
11,328	59,000	.0021	.....	Elastic limit.
11,520	60,000	.0029	.....	
11,904	62,000	.0065	.....	
12,288	64,000	.0088	.....	
12,672	66,000	.0147	.....	
13,056	68,000	.0173	.....	
13,440	70,000	.0259	.....	
13,824	72,000	.0310	.....	
14,208	74,000	.0435	.....	
14,592	76,000	.0630	.....	
14,910	77,660	.1466	.....	Tensile strength.
0	0	.27	.....	= 27 per cent.

Exterior diameter, ″.83″ = .168 reduction.
Appearance of fracture, silky.

No. 5039.

COLD-ROLLED STEEL.

Annular specimen from middle section of endurance shaft No. 174.
Diameters, { exterior, ″.999.
interior, ″.872.
Sectional area, .187 square inch.
Gauged length, 1″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
187	1,000	0.	0.	Initial load.
935	5,000	.0001	.....	
1,870	10,000	.0002	.....	
2,805	15,000	.0004	.....	
3,740	20,000	.0006	.....	
4,675	25,000	.0008	.....	
5,610	30,000	.0009	.....	
6,545	35,000	.0011	.....	
7,480	40,000	.0012	.....	
8,415	45,000	.0014	.....	
9,350	50,000	.0016	.....	
9,724	52,000	.0016	.....	
10,098	54,000	.0017	.....	
10,472	56,000	.0018	.....	
10,846	58,000	.0019	.....	
11,220	60,000	.0021	.....	Elastic limit.
11,594	62,000	.0046	.....	
11,968	64,000	.0075	.....	
12,342	66,000	.0100	.....	
12,716	68,000	.0150	.....	
13,090	70,000	.0195	.....	
13,464	72,000	.0240	.....	
13,838	74,000	.0315	.....	
14,212	76,000	.0440	.....	
14,586	78,000	.0690	.....	
14,720	78,720	.1200	.....	Tensile strength.
0	0	.22	.....	= 22 per cent.

Exterior diameter, ″.85 = ″.149 reduction.
Appearance of fracture, silky.

No. 5040.

COLD-ROLLED STEEL.

Annular specimen from outer end of endurance shaft No. 175.
Diameters, { exterior, ″.999.
interior, ″.869.
Sectional area, .191 square inch.
Gauged length, 1″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
191	1,000	0.	0.	Initial load.
955	5,000	.0001	.....	
1,910	10,000	.0002	.....	
2,865	15,000	.0003	.....	
3,820	20,000	.0005	.....	
4,775	25,000	.0007	.....	
5,730	30,000	.0009	.....	
6,685	35,000	.0010	.....	
7,640	40,000	.0011	.....	
8,595	45,000	.0013	.....	
9,550	50,000	.0015	.....	
9,932	52,000	.0016	.....	
10,314	54,000	.0017	.....	
10,696	56,000	.0018	.....	
11,078	58,000	.0019	.....	
11,279	59,000	.0020	.....	Elastic limit.
11,460	60,000	.0061	.....	
11,842	62,000	.0104	.....	
12,224	64,000	.0158	.....	
12,606	66,000	.0220	.....	
12,988	68,000	.0290	.....	
13,370	70,000	.0395	.....	
13,752	72,000	.0490	.....	
14,134	74,000	.0800	.....	
14,200	74,350	.....	.....	Tensile strength.
0	0	.28	.....	= 28 per cent.

Exterior diameter, ″.82=″.179 reduction.
Appearance of fracture, silky.

No. 5041.

COLD-ROLLED STEEL.

Annular specimen from middle section of endurance shaft No. 175.
Diameters, { exterior, ″.999.
interior, ″.867.
Sectional area, .193 square inch.
Gauged length, 1″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
193	1,000	0.	0.	Initial load.
965	5,000	.0001	.....	
1,930	10,000	.0003	.....	
2,895	15,000	.0005	.....	
3,860	20,000	.0007	.....	
4,825	25,000	.0009	.....	
5,790	30,000	.0011	.....	
6,755	35,000	.0012	.....	
7,720	40,000	.0013	.....	
8,685	45,000	.0016	.....	
9,650	50,000	.0018	.....	
10,036	52,000	.0019	.....	
10,422	54,000	.0020	.....	Elastic limit.
10,808	56,000	.0030	.....	
11,194	58,000	.0051	.....	
11,580	60,000	.0080	.....	
11,966	62,000	.0121	.....	
12,352	64,000	.0150	.....	
12,738	66,000	.0195	.....	
13,124	68,000	.0265	.....	
13,510	70,000	.0349	.....	
13,896	72,000	.0470	.....	
14,282	74,000	.0720	.....	
14,520	75,230	.....	.....	Tensile strength.
0	0	.24	.....	= 24 per cent.

Exterior diameter, ″.83 = ″.169 reduction.
Appearance of fracture, silky.

ANNULAR TENSION SPECIMENS FROM RUPTURED ENDURANCE SHAFTS.

No. 5053.

COLD-DRAWN STEEL.

Annular specimen from outer end of endurance shaft No. 186.
Diameters, { exterior, ″.997.
interior, ″.900.
Sectional area, .145 square inch.
Gauged length, 1″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
145	1,000	0.	0.	Initial load.
725	5,000	.0001	.....	
1,450	10,000	.0003	.....	
2,175	15,000	.0004	.....	
2,900	20,000	.0006	.....	
3,625	25,000	.0008	.....	
4,350	30,000	.0010	.....	
5,075	35,000	.0011	.....	
5,800	40,000	.0012	.....	
6,525	45,000	.0014	.....	
7,250	50,000	.0016	0.	
7,540	52,000	.0016	.....	
7,830	54,000	.0017	.....	
8,120	56,000	.0019	.....	
8,410	58,000	.0020	.....	
8,700	60,000	.0020	.....	
8,990	62,000	.0021	.....	
9,280	64,000	.0023	.....	Elastic limit.
9,570	66,000	.0026	.....	
9,860	68,000	.0029	.....	
10,150	70,000	.0034	.....	
10,440	72,000	.0041	.....	
10,730	74,000	.0049	.....	
11,020	76,000	.0061	.....	
11,310	78,000	.0090	.....	
11,600	80,000	.0140	.....	
11,890	82,000	.0200	.....	
12,180	84,000	.0300	.....	
12,470	86,000	.0510	.....	
12,600	86,900	.1100	.....	Tensile strength.
0	0	.26	.....	= 26 per cent.

Exterior diameter, ″.84 = ″.157 reduction.
Appearance of fracture, silky.

No. 5042.

COLD-ROLLED STEEL.

Annular specimen from outer end of endurance shaft No. 179.
Diameters, { exterior, ".998. interior, ".900.
Sectional area, .146 square inch.
Gauged length, 1".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
146	1,000	0.	0.	Initial load.
730	5,000	.0001	.....	
1,460	10,000	.0002	.....	
2,190	15,000	.0005	.....	
2,920	20,000	.0007	.....	
3,650	25,000	.0008	.....	
4,380	30,000	.0009	.....	
5,110	35,000	.0011	.....	
5,840	40,000	.0013	.....	
6,570	45,000	.0015	.....	
7,300	50,000	.0016	.....	
7,592	52,000	.0016	.....	
7,884	54,000	.0017	.....	
8,176	56,000	.0018	.....	
8,468	58,000	.0019	.....	
8,760	60,000	.0019	.....	
9,052	62,000	.0021	.....	Elastic limit.
9,344	64,000	.0050	.....	
9,636	66,000	.0078	.....	
9,928	68,000	.0127	.....	
10,220	70,000	.0165	.....	
10,512	72,000	.0238	.....	
10,804	74,000	.0330	.....	
11,096	76,000	.0480	.....	
11,388	78,000	.0930	.....	Tensile strength.
0	0	.26	.....	= 26 per cent.

Exterior diameter, ".84 = ".158 reduction.
Appearance of fracture, silky.

No 5043.

COLD-ROLLED STEEL.

Annular specimen from middle section of endurance shaft No. 179.
Diameters, { exterior, ″.998.
interior, ″.900.
Sectional area, .146 square inch.
Gauged length, 1″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
146	1,000	0.	0.	Initial load.
730	5,000	.0001	.....	
1,460	10,000	.0003	.....	
2,190	15,000	.0005	.....	
2,920	20,000	.0007	.....	
3,650	25,000	.0009	.....	
4,380	30,000	.0011	.....	
5,110	35,000	.0012	.....	
5,840	40,000	.0015	.....	
6,570	45,000	.0017	.....	
7,300	50,000	.0019	.....	
7,592	52,000	.0019	.....	
7,884	54,000	.0020	.....	
8,176	56,000	.0021	.....	
8,468	58,000	.0022	.....	
8,760	60,000	.0024	.....	Elastic limit.
9,052	62,000	.0033	.....	
9,344	64,000	.0060	.....	
9,636	66,000	.0098	.....	
9,928	68,000	.0130	.....	
10,220	70,000	.0191	.....	
10,512	72,000	.0255	.....	
10,804	74,000	.0348	.....	
11,096	76,000	.0510	.....	
11,388	78,000	.0720	.....	
11,610	79,520	.1300	.....	Tensile strength.
0	0	.27	.....	= 27 per cent.

Exterior diameter, ″.84 = ″.158 reduction.
Appearance of fracture, silky.

No. 5044.

COLD-ROLLED STEEL (annealed 1032° F.).

Annular specimen from outer end of endurance shaft No. 180.
Diameters, { exterior, ″.998.
interior, ″.900.
Sectional area, .146 square inch.
Gauged length, 1″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
146	1,000	0.	0.	Initial load.
730	5,000	.0001	.....	
1,460	10,000	.0003	.....	
2,190	15,000	.0006	.....	
2,920	20,000	.0007	.....	
3,650	25,000	.0009	.....	
4,380	30,000	.0011	.....	
5,110	35,000	.0012	.....	
5,840	40,000	.0013	.....	
6,570	45,000	.0015	.....	
7,300	50,000	.0018	.....	
7,592	52,000	.0018	.....	
7,884	54,000	.0019	.....	
8,030	55,000	.0020	.....	Elastic limit.
8,176	56,000	.0026	.....	
8,468	58,000	.0038	.....	
8,760	60,000	.0058	.....	
9,052	62,000	.0170	.....	
9,344	64,000	.0190	.....	
9,636	66,000	.0258	.....	
9,928	68,000	.0315	.....	
10,220	70,000	.0430	.....	
10,512	72,000	.0550	.....	
10,804	74,000	.0758	.....	
11,080	75,890	.1550	.....	Tensile strength.
0	0	.32	.....	= 32 per cent.

Exterior diameter, ″.81 = ″.188 reduction.
Appearance of fracture, silky.

No. 5045.

COLD-ROLLED STEEL (annealed 1032° F.).

Annular specimen from middle section of endurance shaft No. 180.
Diameters, { exterior, ″.998. interior, ″.900.
Sectional area, .146 square inch.
Gauged length, 1″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
146	1,000	0.	0.	Initial load.
730	5,000	.0001	.....	
1,460	10,000	.0002	.....	
2,190	15,000	.0004	.....	
2,920	20,000	.0006	.....	
3,650	25,000	.0008	.....	
4,380	30,000	.0010	.....	
5,110	35,000	.0011	.....	
5,840	40,000	.0013	.....	
6,570	45,000	.0015	.....	
7,300	50,000	.0017	.....	
7,592	52,000	.0018	.....	
7,884	54,000	.0019	.....	
8,176	56,000	.0019	.....	
8,468	58,000	.0020	.....	
8,614	59,000	.0022	.....	Elastic limit.
8,760	60,000	.0141	.....	
9,052	62,000	.0169	.....	
9,344	64,000	.0252	.....	
9,636	66,000	.0315	.....	
9,928	68,000	.0400	.....	
10,220	70,000	.0550	.....	
10,512	72,000	.0730	.....	
10,804	74,000	.1400	.....	Tensile strength.
0	0	.32	.....	=32 per cent.

Exterior diameter, ″.80 = ″.198 reduction.
Appearance of fracture, silky.

No. 5046.

COLD-ROLLED STEEL (annealed 645° F.).

Annular specimen from outer end of endurance shaft No. 181.
Diameters, { exterior, ″.999. / interior, ″.900.
Sectional area, .148 square inch.
Gauged length, 1″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
148	1,000	0.	0.	Initial load.
740	5,000	.0001	.....	
1,480	10,000	.0003	.....	
2,220	15,000	.0005	.....	
2,960	20,000	.0007	.....	
3,700	25,000	.0009	.....	
4,440	30,000	.0010	.....	
5,180	35,000	.0011	.....	
5,920	40,000	.0014	.....	
6,660	45,000	.0016	.....	
7,400	50,000	.0018	.....	
7,696	52,000	.0018	.....	
7,992	54,000	.0019	.....	
8,288	56,000	.0019	.....	
8,584	58,000	.0020	.....	
8,880	60,000	.0021	.....	Elastic limit.
9,176	62,000	.0029	.....	
9,472	64,000	.0127	.....	
9,768	66,000	.0200	.....	
10,064	68,000	.0260	.....	
10,360	70,000	.0350	.....	
10,656	72,000	.0470	.....	
10,952	74,000	.0600	.....	
11,248	76,000	.0920	.....	
11,410	77,090	.1450	.....	Tensile strength.
0	0	.32	.....	= 32 per cent.

Exterior diameter, ″.82 = ″.179 reduction.
Appearance of fracture, silky.

No. 5047.

COLD-ROLLED STEEL (annealed 645° F.).

Annular specimen from middle section of endurance shaft No. 181.
Diameters, { exterior, ″.999. / interior, ″.900
Sectional area, .148 square inch.
Gauged length, 1″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
148	1,000	0.	0.	Initial load.
740	5,000	.0001	.....	
1,480	10,000	.0003	.....	
2,220	15,000	.0004	.....	
2,960	20,000	.0007	.....	
3,700	25,000	.0009	.....	
4,440	30,000	.0010	.....	
5,180	35,000	.0011	.....	
5,920	40,000	.0013	0.	
6,660	45,000	.0015	.....	
7,400	50,000	.0017	.....	
7,696	52,000	.0018	.....	
7,992	54,000	.0019	.....	
8,283	56,000	.0020	.....	
8,584	58,000	.0020	.....	
8,880	60,000	.0021	.....	Elastic limit.
9,176	62,000	.0120	.....	
9,472	64,000	.0160	.....	
9,768	66,000	.0210	.....	
10,064	68,000	.0280	.....	
10,360	70,000	.0380	.....	
10,656	72,000	.0520	.....	
10,952	74,000	.0730	.....	
11,200	75,680	.1470	.....	Tensile strength.
0	0	.31	.....	= 31 per cent.

Exterior diameter, ″.81 = ″.189 reduction.
Appearance of fracture, silky.

No. 5048.

COLD-ROLLED STEEL (annealed 1,800° F.).

Annular specimen from outer end of endurance shaft No. 182.
Diameters, { exterior, ″.998.
interior, ″.900.
Sectional area, .146 square inch.
Gauged length, 1″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
146	1,000	0.	0.	Initial load.
730	5,000	.0001	.....	
1,460	10,000	.0002	.....	
2,190	15,000	.0004	.....	
2,920	20,000	.0006	.....	
3,650	25,000	.0008	.....	
4,380	30,000	.0010	.....	
5,110	35,000	.0011	.....	
5,840	40,000	.0012	.....	Elastic limit.
5,986	41,000	.0105	.....	
6,132	42,000	.0160	.....	
6,278	43,000	.0205	.....	
6,424	44,000	.0221	.....	
6,570	45,000	.0260	.....	
6,716	46,000	.0285	.....	
7,008	48,000	.0365	.....	
7,300	50,000	.0420	.....	
7,592	52,000	.0559	.....	
7,884	54,000	.0630	.....	
8,176	56,000	.0790	.....	
8,468	58,000	.0930	.....	
8,760	60,000	.1220	.....	
9,040	61,920	.2240	.....	Tensile strength.
0	0	.44	.....	=44 per cent.

Exterior diameter, ″.75=″.248 reduction.
Appearance of fracture, silky.

No. 5049.

COLD-ROLLED STEEL (annealed 1,800° F.).

Annular specimen from middle section of endurance shaft No. 182.
Diameters, { exterior, ″.997. interior, ″.900.
Sectional area, .145 square inch.
Gauged length, 1″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
145	1,000	0.	0.	Initial load.
725	5,000	.0001	.....	
1,450	10,000	.0003	.....	
2,175	15,000	.0005	.....	
2,900	20,000	.0007	.....	
3,625	25,000	.0009	.....	
4,350	30,000	.0010	0.	
5,075	35,000	.0012	.....	
5,800	40,000	.0014	.....	
5,945	41,000	.0014	.....	
6,090	42,000	.0015	.....	
6,235	43,000	.0016	.....	
6,380	44,000	.0016	.....	
6,525	45,000	.0017	.....	
6,670	46,000	.0019	.....	
6,815	47,000	.0019	.....	
6,960	48,000	.0020	.....	Elastic limit.
7,105	49,000	.0024	.....	
7,250	50,000	.0028	.....	
7,395	51,000	.0035	.....	
7,540	52,000	.0040	.....	
7,685	53,000	.0047	.....	
7,830	54,000	.0053	.....	
7,975	55,000	.0065	.....	
8,120	56,000	.0092	.....	
8,410	58,000	.0123	.....	
8,700	60,000	.0163	.....	
8,990	62,000	.0206	.....	
9,280	64,000	.0268	.....	
9,570	66,000	.0349	.....	
9,860	68,000	.0400	.....	
10,150	70,000	.0526	.....	
10,440	72,000	.0762	.....	
10,620	73,240	.1360	.....	Tensile strength.
0	0	.33	.....	=33 per cent.

Exterior diameter, ″.80=″.197 reduction.
Appearance of fracture, silky.

No. 5050.

COLD-ROLLED STEEL (annealed 1,370° F.).

Annular specimen from outer end of endurance shaft No. 183.
Diameters, { exterior, ″.999. / interior, ″.900.
Sectional area, .148 square inch.
Gauged length, 1″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
148	1,000	0.	0.	Initial load.
740	5,000	.0001	.....	
1,480	10,000	.0003	.....	
2,220	15,000	.0005	.....	
2,960	20,000	.0007	.....	
3,700	25,000	.0008	.....	
4,440	30,000	.0010	.....	
5,180	35,000	.0011	.....	
5,920	40,000	.0013	0.	
6,660	45,000	.0016	.....	
7,400	50,000	.0018	.....	
7,548	51,000	.0018	.....	
7,696	52,000	.0019	.....	
7,844	53,000	.0019	.....	
7,992	54,000	.0020	.....	
8,140	55,000	.0020	.....	Elastic limit.
8,288	56,000	.0028	.....	
8,436	57,000	.0190	.....	
8,584	58,000	.0221	.....	
8,732	59,000	.0238	.....	
8,880	60,000	.0281	.....	
9,176	62,000	.0360	.....	
9,472	64,000	.0480	.....	
9,768	66,000	.0567	.....	
10,064	68,000	.0770	.....	
10,360	70,000	.1100	.....	
11,840	70,810	.1600	.....	Tensile strength.
0	0	.32	.....	=32 per cent.

Exterior diameter, ″.81 = ″.189 reduction.
Appearance of fracture, silky.

No. 5051.

COLD-ROLLED STEEL (annealed, 1,370° F.).

Annular specimen from middle section of endurance shaft No. 183.
Diameters, { exterior, ″.998. / interior, ″.900.
Sectional area, .146 square inch.
Gauged length, 1″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
146	1,000	0.	0.	Initial load.
730	5,000	.0001	.....	
1,460	10,000	.0002	.....	
2,190	15,000	.0004	.....	
2,920	20,000	.0006	.....	
3,650	25,000	.0008	.....	
4,380	30,000	.0009	.....	
5,110	35,000	.0011	.....	
5,840	40,000	.0012	.....	
6,570	45,000	.0014	.....	
7,300	50,000	.0020	.0004	Elastic limit.
7,446	51,000	.0021	.....	
7,592	52,000	.0024	.....	
7,738	53,000	.0029	.....	
7,884	54,000	.0090	.....	
8,030	55,000	.0150	.....	
8,176	56,000	.0210	.....	
8,322	57,000	.0253	.....	
8,468	58,000	.0268	.....	
8,614	59,000	.0278	.....	
8,760	60,000	.0311	.....	
9,052	62,000	.0430	.....	
9,344	64,000	.0550	.....	
9,636	66,000	.0680	.....	
9,928	68,000	.0850	.....	
10,220	70,000	.1540	.....	Tensile strength.
0	0	.37	.....	=37 per cent.

Exterior diameter, ″.79 = ″.208 reduction.
Appearance of fracture, silky.

No. 5052.

COLD-ROLLED STEEL (annealed, 1,375° F.).

Annular specimen from outer end of endurance shaft No. 184.
Diameters, { exterior, ″.999. / interior, ″.900.
Sectional area, .148 square inch.
Gauged length, 1″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
148	1,000	0.	0.	Initial load.
740	5,000	.0001	.....	
1,480	10,000	.0003	.....	
2,220	15,000	.0005	.....	
2,960	20,000	.0007	.....	
3,700	25,000	.0008	.....	
4,440	30,000	.0010	.....	
5,180	35,000	.0011	.....	
5,920	40,000	.0013	.....	
6,660	45,000	.0015	.....	
7,400	50,000	.0016	0.	
8,140	55,000	.0018	.....	
8,288	56,000	.0019	.....	
8,436	57,000	.0019	.....	
8,584	58,000	.0019	.....	
8,732	59,000	.0020	.....	
8,880	60,000	{ .0021 / .0055	.....	Elastic limit.
9,176	62,000	.0143	.....	
9,472	64,000	.0186	.....	
9,768	66,000	.0267	.....	
10,064	68,000	.0293	.....	
10,360	70,000	.0455	.....	
10,656	72,000	.0530	.....	
10,952	74,000	.0760	.....	
11,190	75,610	.1530	.....	Tensile strength.
0	0	.32	.....	= 32 per cent.

Exterior diameter, ″.82 = ″.179 reduction.
Appearance of fracture, silky.

No. 5054.

COLD-ROLLED STEEL (annealed, 1,783° F.).

Annular specimen from outer end of endurance shaft No. 185.
Diameters, { exterior, ″.997. / interior, ″.878.
Sectional area, .175 square inch.
Gauged length, 1″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
175	1,000	0.	0.	Initial load.
875	5,000	.0001	.....	
1,750	10,000	.0001	.....	
2,625	15,000	.0003	.....	
3,500	20,000	.0005	.....	
4,375	25,000	.0007	.....	
5,250	30,000	.0009	.....	
6,125	35,000	.0010	.....	
7,000	40,000	.0012	.....	
7,875	45,000	.0013	.....	
8,750	50,000	.0015	.....	Elastic limit.
9,100	52,000	.0050	.....	
9,450	54,000	.0145	.....	
9,800	56,000	.0190	.....	
10,150	58,000	.0235	.....	
10,500	60,000	.0320	.....	
10,850	62,000	.0404	.....	
11,200	64,000	.0540	.....	
11,550	66,000	.0670	.....	
11,900	68,000	.1005	.....	
12,120	69,260	.1670	.....	Tensile strength.
0	0	.34	.....	=34 per cent.

Exterior diameter, ″.80 = ″.197 reduction.
Appearance of fracture, silky.

No. 5055.

COLD-ROLLED STEEL (annealed, 1,785° F.).

Annular specimen from middle section of endurance shaft No. 185.
Diameters, { exterior, ″.998. / interior, ″.873.
Sectional area, .184 square inch.
Tensile strength, 12,640 pounds=68,700 pounds per square inch.
Appearance of fracture, silky.

TABULATION OF ANNULAR TENSION SPECIMENS FROM ENDURANCE SHAFTS.

SPECIMENS FROM UNRUPTURED SHAFTS.

No. of tension test.	No. of endurance test.	Material.	Location in shaft.	Sectional area.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation of inch section.	Reduction of exterior diameter.	Appearance of fracture.	Remarks.
				Sq. inch	*Pounds.*	*Pounds.*	*Inch.*	*Inch.*		
5027	164	Cold-rolled steel	Outer end	.164	58,000	78,110	.16	.1182	Silky.	
5028	164	do	Middle	.167	54,000	78,000	.11	.0790	do.	
5029	166	do	Outer end	.184	60,000	80,220	.24	.139	do.	
5030	166	do	Middle	.184	52,000	60,000	.04	.019	50 per cent silky; 50 per cent in irregular patches, granular.	
5031	167	do	Outer end	.182	60,000	80,220	.28	.149	Silky.	
5031*a*	167	do	Middle	.182	.....	40,000	.02	.019	Granular, 60 per cent; silky, 40 per cent.	
5032	169	do	Outer end	.200	58,000	79,550	.24	.159	Silky.	
5033	169	do	Middle	.180	56,000	70,000	.08	.039	90 per cent silky, 10 per cent fractured during endurance test of shaft.	
5034	172	do	Outer end	.181	59,000	75,250	.26	.169	Silky.	
5035	172	do	Middle	.191	59,000	78,000	.27	.169	do.	
5036	173	do	Outer end	.189	60,000	79,680	.26	.168	do.	
5037	173	do	Middle	.189	60,000	78,470	.29	.189	do.	
5038	174	do	Outer end	.192	59,000	77,660	.27	.168	do.	
5039	174	do	Middle	.187	60,000	78,720	.22	.149	do.	
5040	175	do	Outer end	.191	59,000	74,350	.28	.170	do.	
5041	175	do	Middle	.198	54,000	75,230	.24	.169	do.	

SPECIMENS FROM RUPTURED SHAFTS.

5053	186	Cold-drawn steel	Outer end	.145	64,000	86,900	.26	.157	Silky.	
5042	179	Cold-rolled steel	do	.146	62,000	78,000	.26	.158	do.	
5043	179	do	Middle	.146	60,000	79,520	.27	.158	do.	
5044	180	do	Outer end	.146	55,000	75,890	.32	.188	do.	Annealed.
5045	180	do	Middle	.146	59,000	74,000	.32	.198	do.	Do.
5046	181	do	Outer end	.148	60,000	77,090	.32	.179	do.	Do.
5047	181	do	Middle	.148	60,000	75,680	.31	.189	do.	Do.
5048	182	do	Outer end	.146	40,000	61,920	.44	.248	do.	Do.
5049	182	do	Middle	.145	48,000	73,240	.33	.197	do.	Do.
5050	183	do	Outer end	.148	55,000	70,810	.32	.189	do.	Do.
5051	183	do	Middle	.146	50,000	70,000	.37	.208	do.	Do.
5052	184	do	Outer end	.148	60,000	75,610	.32	.179	do.	Do.
5054	185	do	do	.175	50,000	69,260	.34	.197	do.	Do.
5055	185	do	Middle	.184	.....	68,700	.....	.....	do.	Do.

SYNOPSIS OF RECORD OF ENDURANCE SHAFTS AND ANNULAR SPECIMENS TAKEN THEREFROM.

COLD-ROLLED STEEL SHAFTS.

TENSILE SPECIMENS FROM UNRUPTURED SHAFTS.

Endurance record.			Tensile record of annular specimens from—				Gain or loss of middle specimen.		Remarks.
			Outer end of shaft.		Middle of shaft.				
No. of test.	Fiber stress per square inch.	Number of rotation.	No. of test.	Tensile strength per square inch.	No. of test.	Tensile strength per square inch.	Gain.	Loss.	
	Pounds.			*Pounds.*		*Pounds.*	*Pounds.*	*Pounds.*	
172	45,000	50,200	5034	75,250	5035	78,000	2,750	.....	
173	45,000	50,000	5036	79,680	5037	78,470	.....	1,210	
174	45,000	50,000	5038	77,660	5039	78,720	1,060	.....	
175	45,000	50,000	5040	74,350	5041	75,230	880	.....	
164	55,000	50,000	5027	78,110	5028	78,000	.....	110	
166	55,000	50,000	5029	80,220	5030	60,000	.....	20,220	Incipient cracks began during endurance test.
167	55,000	50,000	5031	80,220	5031*a*	40,000	.....	40,220	Do.
169	55,000	40,000	5032	79,550	5033	70,000	.....	9,550	Do.

TENSILE SPECIMENS FROM RUPTURED SHAFT.

185	40,000	238,880	5054	69,260	5055	68,700	.....	560	Annealed, 1,783° F.

TENSILE SPECIMENS FROM SHAFTS LOADED ON DOUBLE BEARINGS AT MIDDLE.

179	40,000	857,400	5042	78,000	5043	79,520	1,520	.....	
180	40,000	211,000	5044	75,890	5045	74,000	.....	1,890	Annealed, 1,032° F.
181	40,000	234,300	5046	77,090	5047	75,680	.....	1,410	Annealed, 645° F.
182	40,000	102,000	5048	61,920	5049	73,240	11,320	.....	Annealed, 1,800° F.
183	40,000	194,000	5050	70,810	5051	70,000	.....	810	Annealed, 1,370° F.
184	40,000	243,200	5052	75,610	.....	.....	.....	.....	Annealed, 1,375° F.
186	40,000	838,200	5053	86,900	.....	.....	.....	.....	Cold-drawn steel.

VULCANIZED INDIA RUBBER

FOR

UNITED STATES GEOLOGICAL SURVEY.

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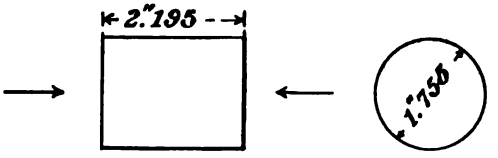
COMPRESSION TESTS.

Form of specimens.



No. 5876.

Marks, No. 1.
Contains 1½ ounces sulphur per pound of pure rubber.
Weight of specimen, 85.4300 grammes.
Length, 2″.195.
Diameter, 1″.755.
Ends of specimen greased.

Applied loads.	Length.	Total compression.	Middle diameters.		Remarks.
			Vertical.	Horizontal.	
Pounds.	*Inches.*	*Inch.*	*Inches.*	*Inches.*	
5	2.182	.013	1.757	1.766	Temperature of room, 68½° F.
10	2.172	.023	1.762	1.763	
20	2.110	.085	1.788	1.790	Remained under stress 1 hour.
30	2.069	.126	1.806	1.808	
40	2.049	.146	1.818	1.820	
50	2.012	.183	1.833	1.836	
					Rested without load 3 hours.
70	1.918	.277	1.876	1.882	
90	1.870	.325	1.898	1.906	Temperature of room, 68° F.
110	1.820	.375	1.926	1.928	
130	1.781	.464	1.976	1.982	
150	1.701	.494	1.988	1.998	
0	2.193	.002	1.757	.....	Rested 10 hours.
150	1.730	.465	1.978	1.984	Temperature of room, 67° F.
	1.730	.465	1.979	1.984	After 13 minutes.
200	1.634	.561	2.035	2.040	
250	1.537	.658	2.098	2.106	
300	1.457	.738	2.154	2.168	
400	1.325	.870	.....	.....	Turned over, the axis of the specimen changing to a position at right angles to the direction of applied pressure.
					Removed from machine and ends greased.
400	1.326	.869	2.257	2.265	
					Turned over.
500	.....	.....	.....	.....	Specimen turned before reading could be taken.
500	1.233	.962	2.365	2.355	
					Grease wiped off ends.
900	.....	.....	.....	.....	Specimen turned over.
0	2.195	0.	.....	.....	

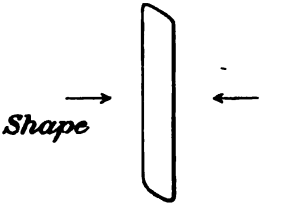
No. 5877.

Marks, No. 5.
Contains 2 ounces sulphur per pound of pure rubber.
Length, 2″.156.
Diameters, { 1″.758 maximum. 1″.725 minimum.
Ends greased.

Applied loads.	Length.	Total compression.	Middle diameters.		Remarks.
			Vertical.	Horizontal.	
Pounds.	*Inches.*	*Inch.*	*Inches.*	*Inches.*	
20	2.060	.096	1.792	1.792	Temperature of room, 70° F.
50	1.943	.213	1.846	1.847	
100	1.758	.398	1.941	1.942	
150	1.622	.534	2.024	2.023	
200	1.478	.678	2.118	2.116	
250	1.376	.780	2.196	2.194	
300	1.301	.855	2.260	2.257	
400	1.157	.999	2.402	2.398	End diameters smaller, little bulged.
500	.....	.....	.....	.....	Specimen turned.

No. 5880.

Marks, No. 6.
Contains 2 ounces sulphur per pound of pure rubber.
Length, 1″.102.
Diameters, { 1″.745 vertical. 1″.719 horizontal.

Applied loads.	Length.	Total compression.	Middle diameters.		Remarks.
			Vertical.	Horizontal.	
Pounds.	*Inches.*	*Inch.*	*Inches.*	*Inches.*	
50	.995	.107	1.842	1.812	
100	.905	.197	.....	.....	
200	.778	.324	.....	.....	
400	.606	.496	.....	.....	
600	.490	.612	.....	.....	
800	.416	.686	.....	.....	
1,000	.375	.727	.....	.....	
2,000	.277	.825	.....	.....	
0	1.091	.011	.....	.....	
0	1.099	.003	.....	.....	Length after 3 days 16 hours' rest.
0	1.099	.....	.....	.....	Length after 10 days' rest.

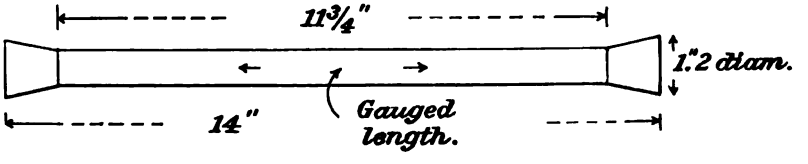
No. 5881.

Marks, No. 7.
Contains 1½ ounces sulphur per pound of pure rubber.
Length, ″.992.
Diameters, { 1″.751 vertical. / 1″.752 horizontal.

Applied loads.	Length.	Total compression.	Middle diameters.		Remarks.
			Vertical.	Horizontal.	
Pounds.	*Inch.*	*Inch.*	*Inches.*	*Inches.*	
50	.932	.060	1.814	1.817	
100	.872	.120	1.876	1.872	
200	.770	.222	1.993	1.989	
400	.630	.362	2.214	2.209	
600	.541	.451	.....	.....	Specimen distorted.
800	.473	.519	.....	.....	
1,000	.421	.571	.....	.....	
2,000	.308	.684	.....	.....	
0	.987	.....	.....	.....	
0	.992	.....	.....	.....	Length after 5 days' rest.

Tension Tests.

Form of specimens.



No. 5878.

Mark, B.
Contains 1½ ounces sulphur per pound of pure rubber.
Diameter, ″.755.
Gauged length, 3″.96.

Applied loads.	Gauged length.	Total elongation.	Middle diameters.		Remarks.
			Vertical.	Horizontal.	
Pounds.	*Inches.*	*Inches.*	*Inch.*	*Inch.*	
10	5.53	1.57	.633	.638	Temperature of room, 73° F.
20	10.00	6.04	.472	.478	
25	17.37	8.41	.424	.429	
(a)	.....	.....	.....	.....	Rubber fractured near head, at end of cloth filling.
0	4.15	.19	.....	.....	Immediate length after fracture.

a Between 25 and 30.

No. 5879.

Mark, A.
Contains 2 ounces sulphur per pound of pure rubber.
Diameters, { ″.745 vertical. ″.750 horizontal.
Gauged length 3″.95.

Applied loads.	Gauged length.	Total elongation.	Middle diameters.		Remarks.
			Vertical.	Horizontal.	
Pounds.	*Inches.*	*Inches.*	*Inch.*	*Inch.*	
5	4.33	.38	.715	.717	Temperature of room, 75° F.
10	4.90	.95	.674	.677	
15	5.35	1.40	.641	.648	
20	6.61	2.66	.575	.583	
25	7.74	3.79	.531	.537	
30	9.20	5.25	.487	.492	
35	10.72	6.77	.452	.456	
40	12.38	8.43	.423	.426	
45	13.68	9.73	.400	.404	
50	15.56	11.61	.377	.380	Test discontinued.
0	4.20	.25	.....	.....	Immediate set.
0	4.01	.06	.....	.....	After one-half hour rest.

No. 5882.

Mark, C.
Contains 1½ ounces sulphur per pound of pure rubber.
Diameters, { ″.764 vertical. ″.754 horizontal.
Gauged length, 3″.52.

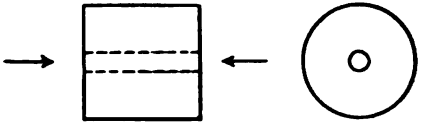
Applied loads.	Gauged length.	Total elongation.	Middle diameters.		Remarks.
			Vertical.	Horizontal.	
Pounds.	*Inches.*	*Inches.*	*Inch.*	*Inch.*	
5	3.74	.22	.743	.732	
10	3.99	.47	.713	.704	
15	4.29	.77	.691	.676	
20	4.64	1.12	.664	.651	
25	5.07	1.55	.636	.623	
30	5.58	2.06	.606	.592	
35	6.15	2.63	.576	.566	
40	6.84	3.32	.548	.536	
45	7.56	4.04	.519	.510	
50	8.29	4.77	.496	.487	
	8.38	4.86	.494	.484	After 1½ hours.
40	7.04	3.52	.541	.531	
30	5.74	2.22	.....	.....	
20	4.78	1.26	.....	.....	
10	4.08	.56	.....	.....	
0	3.57	.05	.760	.744	

No. 5883.

Mark, D.
Contains 2 ounces sulphur per pound of pure rubber.
Diameters, { ″.753 vertical. ″.752 horizontal.
Gauged length, 3″.25.

Applied loads.	Gauged length.	Total elongation.	Middle diameters.		Remarks.
			Vertical.	Horizontal.	
Pounds.	*Inches.*	*Inches.*	*Inch.*	*Inch.*	
5	3.67	.42	.706	.705	
10	4.21	.96	.659	.656	
15	5.06	1.81	.599	.596	
20	6.33	3.08	.531	.532	
25	8.08	4.83	.472	.471	
30	9.85	6.60	.427	.426	
35	11.63	8.38	.392	.393	
40	13.37	10.12	.367	.367	
45	15.02	11.77	.346	.348	
50	16.24	12.99	.....	.....	Specimen fractured near one conical end.
0	3.44	.19	.736	.735	

COMPRESSION OF RUBBER BUFFERS.



No. of test.	Dimensions.			Weight.		Compression under loads of—						Remarks.
		Diameters.				5,000 pounds.		10,000 pounds.		20,000 pounds.		
	Length.	Exterior.	Hole.	Pounds.	Ounces.	Total compression.	Set.	Total compression.	Set.	Total compression.	Set.	
	Inches.	*Inches.*	*Inch.*			*Inches.*	*Inch.*	*Inches.*	*Inch.*	*Inches.*	*Inch.*	
5862	6.00	5.92	1.00	10	10	1.57	.08	2.75	.22	3.50	.45	
5863	6.00	5.92	1.00	10	10	1.80	.10	2.67	.21	3.44	.43	
5864	6.00	5.92	1.00	10	10	1.32	.02	2.32	.08	3.25	.18	
5865	6.00	5.92	1.00	10	10	1.62	.07	2.72	.25	3.49	.59	
5866	6.00	5.92	1.00	10	10	1.30	.05	2.32	.10	3.18	.23	
5867	6.00	5.92	1.00	10	10	1.46	.05	2.54	.13	3.37	.29	
5885	6.03	5.99	1.00	10	14	1.14	0.	2.91	.03	3.02	.05	
						1.36	.06	2.35	.08	3.10	.10	Second test.
5886	6.07	5.99	1.00	10	15	1.22	.02	2.14	.04	3.12	.09	
						1.58	.02	2.44	.05	3.00	.10	
						1.97	.10	2.69	.11	3.08	.17	Do.
5887	4.97	4.99	1.00	6	¼						.07	
						1.72	.11	2.59	.13	3.02	.16	Third test, after resting 4 months 7 days.
						1.99	.16	2.70	.17	3.07	.18	Fourth test.
						1.53	.04	2.41	.07	3.01	.14	
						1.97	.12	2.68	.14	3.10	.17	Second test.
5888	5.00	4.99	1.00	6	1¼	2.08	.15	2.75	.17	3.13	.19	Third test.
											.11	
						1.80	.14	2.60	.16	3.07	.18	Fourth test, after resting 4 months 7 days.
5987	4.96	4.95	0.98	6	2	1.13	.02	1.84	.07	2.48	.14	
5988	5.01	4.94	1.00	6	2¼	1.11	.03	1.85	.06	2.68	.14	

The tendency to develop increased sets under successive loadings of the buffers is shown in Nos. 5885, 5887, and 5888, and also the greater compressions effected under 5,000 and 10,000 pounds after the first loading, and further, the gain in rigidity after a period of rest indicates a tendency to recover from the immediate effects of overloading.

TENSILE TESTS OF STRANDS OF GALVANIZED WIRE TRANSMISSION ROPES. ARSENAL FOUNDRY DRIVE.

No. 5915.

Mark, A.

Strand representing old rope. Composed of 7 wires ".085 diameter each.

Sectional area, .0397 square inch.

Tensile strength, 2459 pounds = 61,940 pounds per square inch.

No. 5916.

Mark, B.

Strand from new rope. Composed of 19 wires ".047 diameter each.

Sectional area, .0330 square inch.

Tensile strength, 2,118 pounds = 64,180 pounds per square inch.

TENSILE TESTS OF COTTON CLOTH.

Strips tested 2" wide each.

No. of test.	Marks.	Picks per inch.		Tensile strength.	
		Warp.	Filling.	Warp.	Filling.
				Pounds.	*Pounds.*
5859	Bid A, J. H. Lane & Co	44	40	98	139
5860	Bid B, J. H. Lane & Co	40	36	123	157
5861	T C, from Catlin & Co	42	42	102	108

CHEMICAL ANALYSES OF STEEL AND IRON.

Description of material.	Chemical composition.							
	Carbon.			Manganese	Silicon.	Sulphur.	Phosphorus.	Copper.
	Total.	Graphitic.	Combined.					
Belleville spring steel disk	0.748	0.030	0.718	0.520	0.037	0.058	0.100	Trace.
Do	0.753	0.053	0.700	0.439	0.039	0.055	0.090	Trace.
Belleville spring, not heated, rejected spring			(0.372 / 0.360)					
Belleville spring, chips from surface			0.360					
Belleville spring, broke punching, surface metal	0.395							
Belleville springs, surface of burrs, rejected springs			(0.363 / 0.410)					
Belleville spring:								
Near surface	0.484	0.032	0.452	0.310	0.042	0.017	0.045	None.
$\frac{1}{16}$" below surface	0.553	0.042	0.611	0.309	0.039	0.015	0.048	0.000
$\frac{1}{4}$" below surface	0.727	0.043	0.674	0.361	0.040	0.012	0.047	0.000
Locomotive spring, 4". 02 wide, ". 375 thick	0.743	0.043	0.700	0.232	0.105	.....	0.042	.....
Harveyized steel bar:								
From center, 3". 5 bar	0.358	0.018	0.340	1.122	0.035	0.066	0.074	.....
$\frac{1}{8}$" from surface, 3". 5 bar	0.383	0.015	0.368	1.191	0.040	0.067	0.016	.....
". 23 from surface, 3". 5 bar	0.456	0.031	0.425	0.865	0.040	0.065	0.015	.....
Electrically welded steel bar	0.395	0.013	0.382	0.597	0.052	0.091	0.078	0.000
Steel bloom forged down in arsenal smith shop	0.186	0.010	0.176	0.464	0.170	0.071	0.048	0.000
Cast iron from heat August 5, 1892, arsenal foundry	.....	.....	.....	.....	1.700	0.110	.....	.....
Charcoal flange iron, Glasgow Iron Company	0.007	0.007	0.000	None.	0.037	0.024	0.035	None.

CHEMICAL ANALYSES OF BRONZE.

Description of material.	Chemical composition.					Remarks.
	Copper.	Tin.	Zinc.	Iron.	Manganese.	
Bronze mixture for 8" B. L. rifle carriage.	87.00	7.78	4.85	.....	.....	
Bronze for life-saving guns, No. 33.	91.14	8.84	0.00	.....	.....	See report of 1884 for tension test, page 423.
Bronze for life-saving guns, No. 49.	91.35	8.60	0.00	.....	.....	See report of 1884 for tension test, page 425.
Bronze for life-saving guns, No. 63.	91.72	8.19	0.00	.....	.....	See report of 1884 for tension test, page 426.
Bronze for life-saving guns, No. 71.	91.50	8.46	0.00	.....	.....	See report of 1884 for tension test, page 427.
Bronze for life-saving guns, No. 97.	91.35	8.84	0.00	.....	.....	See report of 1884 for tension test, page 430.
Manganese bronze	55.24	0.00	40.63	2.54	1.52	

TESTS MADE FOR PRIVATE PARTIES DURING THE FISCAL YEAR ENDED JUNE 30, 1893.

Date.	Material.	For whom tested.		
		Name.	City.	State.
1892.				
July 8	Marble	Norcross Bros.	Boston	Mass.
14	Copper cylinders	California Powder Co.	Santa Cruz	Cal.
18	Belleville springs.	S. D. Tripp.	Lynn	Mass.
20	Granite	Ira H. Woolson	New York	N. Y.
20	Bricks	J. C. Hubinger & Co.	Keokuk	Iowa.
21	Wrought-iron plate.	W. U. Fairbairn	Boston	Mass.
26	Bell insulators	Revere Rubber Co.	do	Mass.
26	Low Moor iron	Houghton & Richards	do	Mass.
26	Steel plates	E. D. Leavitt	Cambridgeport	Mass.
29	Cement briquettes	Walter G. Berg	Jersey City	N. J.
Aug. 12	Rubber belting	Boston Woven Hose and Rubber Co.	Cambridgeport	Mass.
12	Belleville springs.	Carver Cotton Gin Co.	East Bridgewater	Mass.
16	Hydraulic gange	Star Brass Manufacturing Co.	Boston	Mass.
17	Terra cotta	Boston Terra Cotta Co.	do	Mass.
18	Columns	Jones & Laughlin, Limited	Chicago	Ill.
20	Wrought-iron bolts.	West End Street Railway Co.	Boston	Mass.
30	Wrought-iron castings.	Wrought Iron Casting Co.	South Boston	Mass.
31	Low Moor iron	Houghton & Richards	Boston	Mass.
31	Sandstone	Edwin F. Glenn	St. Paul	Minn.
Sept. 1	Glass insulator	Samuel Oakman	Boston	Mass.
7	Steel plate	Warden Manufacturing Co.	Philadelphia	Pa.
9	Granite	Milford Pink Granite Co	Boston	Mass.
13	Bricks	Norcross Bros.	Providence	R. I.
14	Steel bars	Hawkridge Bros.	Boston	Mass.
14	do	E. D. Leavitt	Cambridgeport	Mass.
16	Cast iron	Bridgewater Iron Co.	Bridgewater	Mass.
29	Hydraulic gauges.	Star Brass Manufacturing Co.	Boston	Mass.
29	Riveted joints	Wm. U. Fairbairn	do	Mass.
Oct. 1	Sandstone	John L. Burke.	Hot Springs	S. Dak.
13	Granite	Maine and New Hampshire Granite Co.	Portland	Me.
14	do	do	do	Me.
15	Steel bars	Washburn Car Wheel Co.	Worcester	Mass.
27	Deoxidized bronze	Hartford Steam Boiler Inspection and Insurance Co.	Boston	Mass.
Nov. 1	Steel bars	Washburn Car Wheel Co.	Worcester	Mass.
1	Chain	Memphis Artesian Water Co.	Memphis	Tenn.
3	Bricks	Norcross Bros.	Providence	R. I.
17	Cast iron	Golding & Co.	Boston	Mass.
17	Copper cylinders	California Powder Co.	Santa Cruz	Cal.
22	Cast iron	John Souther & Co.	Boston	Mass.
22	Wrought iron	Boston Forge Co.	East Boston	Mass.
26	Turn-buckles	Laconia Car Co.	Laconia	N. H.
26	Composition	Peter Johnson	Dassel	Minn.
30	Insulator	Revere Rubber Co.	Boston	Mass.
30	Adhesion of nails.	Cut-nail manufacturers.		
Dec. 6	Manganese bronze	Waldo & Stout	Bridgeport	Conn.
8	Steel plate	Harrington & Robinson	Boston	Mass.
8	Paving bricks	North American Pyrogranit Co.	New York	N. Y.
9	Adhesion of nails.	Severance Nail Machine Co.	St. Paul	Minn.
13	do	do	do	Minn.
15	Wrought-iron bars	Rhode Island Locomotive Works	Providence	R. I.
20	Steel columns	Carnegie Steel Co., Limited	Pittsburg	Pa.
1893				
Jan. 6	Wrought-iron casting.	Wrought Iron Casting Co.	South Boston	Mass.
6	Cast iron	Armington & Sims Engine Co.	Providence	R. I.
6	Steel plate	Harrison Loring	Boston	Mass.
6	Cement briquettes	Walter G. Berg	Jersey City	N. J.
6	Anchors	Laconia Car Co.	Laconia	N. H.
7	Rope	Manhattan Supply Co.	New York	N. Y.
13	Springs	Haley Manufacturing Co.	Concord	N. H.
13	Paving bricks	Somerset & Johnsonburg Manufacturing Co.	Johnsonburg	Pa.
14	Deoxidized bronze	Hartford Steam Boiler Inspection and Insurance Co.	Hartford	Conn.
16	Adhesion of nails.	Cut-nail manufacturers.		
25	Steel bars	Pennsylvania R. R. Co.	Altoona	Pa.
30	Welded steel bars.	Thomson Electric Welding Co.	Lynn	Mass.
31	Steel casting	Neponset Steel Casting Co.	Neponset	Mass.
31	Cast iron	Armington & Sims Engine Co.	Providence	R. I.
31	Insulated pull-off.	Revere Rubber Co.	Boston	Mass.

Tests made for private parties during the fiscal year ended June 30, 1893—Continued.

Date.	Material.	For whom tested.		
		Name.	City.	State.
1893.				
Feb. 1	Adhesion of nails.	Cut-nail manufacturers.		
6	Wrought-iron bars	Wm. M. Horne & Co	Boston	Mass.
6	Steel bars	Eastern Forge Co	do	Mass.
7	Steel plate	Wm. Allen & Sons	Worcester	Mass.
7	Sheet copper	Chas. R. Fletcher	Boston	Mass.
7	Granite	White Granite Co	New York	N. Y.
7	Brick	C. F. Oakley	Kingston	Mass.
14	Steel plates	Wm. Allen & Sons	Worcester	Mass.
14	do	Harrison Loring	South Boston	Mass.
18	Welded steel bars.	Thomson Electric Welding Co	Boston	Mass.
25	Cast iron	Bridgewater Iron Co	Bridgewater	Mass.
Mar. 2	Sail duck	Whiton Bro. & Co	Boston	Mass.
2	Cast iron	Phenix Iron Foundry	Providence	R. I.
6	Chain	Artesian Water Co	Memphis	Tenn.
7	Tackle blocks	Walter Coleman & Sons	Providence	R. I.
8	Coiled spring	Haley Manufacturing Co	Concord	N. H.
8	Steel plates	Wm. Allen & Sons	Worcester	Mass.
8	Steel bars	Hickory Wheel Co	Newton	Mass.
9	Limestone	Bowling Green Stone Co	Louisville	Ky.
9	Artificial stone	C. W. Mettler	Hartford	Conn.
13	Steel plate	Harrison Loring	South Boston	Mass.
14	Granite	E. B. Mallet, jr	Freeport	Me.
22	Tackle blocks	Walter Coleman & Sons	Providence	R. I.
24	Marble	Vermont Marble Co	Proctor	Vt.
25	Steel bars	Pennsylvania R. R. Co	Altoona	Pa.
27	Steel plates	Cunningham Iron Works Co	South Boston	Mass.
27	Duck	Manhattan Supply Co	New York	N. Y.
27	Cast iron	City of Cambridge	Cambridge	Mass.
30	Tackle blocks	Boston and Lockport Block Co	Boston	Mass.
30	Special metal	do	do	Mass.
Apr. 1	Duck	Manhattan Supply Co	New York	N. Y.
1	Wrought iron	B. M. Jones & Co	Boston	Mass.
10	Brick ashlar	Fiske, Holmes & Co	do	Mass.
15	Steel plates	Cunningham Iron Works Co	do	Mass.
15	do	Wm. Allen & Sons	Worcester	Mass.
15	Steel wire	Page, Newell & Co	Boston	Mass.
15	Copper tape	Chas. R. Fletcher	do	Mass.
15	Wrought-iron bar.	B. M. Jones & Co	do	Mass.
15	Malleable-iron anchor.	Laconia Car Co	Laconia	N. H.
17	Bridge wire	Washburn & Moen Manufacturing Co.	Worcester	Mass.
18	Tackle blocks	Boston and Lockport Block Co	Boston	Mass.
18	Cast iron	Armington & Sims Engine Co	Providence	R. I.
19	Cast-iron plates	North Packing and Provision Co	Somerville	Mass.
19	Bricks	Pasadena Terra Cotta Co	Wheatland	N. J.
20	Wood	Wason Manufacturing Co	Springfield	Mass.
25	Steel wire	Page, Newell & Co	Boston	Mass.
25	Cast iron	Bridgewater Iron Co	Bridgewater	Mass.
25	Steel bar	Washburn Car Wheel Co	Worcester	Mass.
25	Bronze	Boston and Lockport Block Co	Boston	Mass.
26	Cast iron	Bridgewater Iron Co	Bridgewater	Mass.
May 2	Steel plates	Wm. Allen & Sons	Worcester	Mass.
10	Artificial stone	Graham Pressed Concrete Co	Chicago	Ill.
17	Steel plates	Edwd. Kendall & Sons	Cambridgeport	Mass.
29	Steel tubing	Pope Manufacturing Co	Hartford	Conn.
June 8	Copper wire and rod.	United States Cold Wire Rolling Co.	Hammond	Ind.
8	Steel wire	Page, Newell & Co	Boston	Mass.
8	Steel plate	Albert C. Isaacs	Baltimore	Md.
8	Copper wire and rod.	Chas. R. Fletcher	Boston	Mass.
9	Car coupler	Manley Howe	South Boston	Mass.
9	Cast-iron piston head.	Hunt-Spiller Manufacturing Co	do	Mass.
10	Tackle blocks	Walter Coleman & Sons	Providence	R. I.
13	Sandstone	New England Brown Stone Co	Cromwell	Conn.
13	do	Tenino Stone Quarry Co	Tenino	Wash.
18	Wrought-iron plate.	Massachusetts General Hospital	Boston	Mass.
14	Steel bars	Albert C. Isaacs	Baltimore	Md.
19	Bricks	Corning Clay Works	St. Paul	Minn.
19	Car couplers	Springfield Malleable Iron Co	Springfield	Ohio.
20	Steel tubing	Pope Manufacturing Co	Hartford	Conn.
24	Cement briquettes	Walter G. Berg	Jersey City	N. J.
24	Wood	Wason Manufacturing Co	Springfield	Mass.
27	Steel tubing	Pope Manufacturing Co	Hartford	Conn.
30	Boiler tubes	Colen Flue Exp. and Beade Co	do	Conn.
30	Bricks	Hiram Walker	Detroit	Mich.

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